THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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THE

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(J. A. BERLY'S),

1908 EDITION

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AN ACTION FOR SLANDER.

AN action for slander which was recently tried at the Gloucester Assizes, before Mr. Justice A. T. Lawrence, affords an illustration of the unpleasant ordeals through which a borough electrical engineer may have to pass in the performance of his duties. The actions of all public servants are bound to be the subject of public criticism; but it is often the unenviable fate of those who are employed by local authorities to have to bear the brunt of the disputes which rage between the contending factions amongst their employers.

The story may be very briefly told. The plaintiff in the action, Mr. Walter James Bache, was formerly an electrical engineer in Gloucester, where he was in receipt of a salary of £300 a year. While he was at Gloucester, the Cheltenham electricity works were being run at a considerable loss; so much so that in 1904 there was an accumulated deficit of £16,000. In the following year Mr. Bache was approached with a view to his becoming borough electrical engineer at Cheltenham, it being hoped that his skill and experience would enable the Cheltenham Corporation to run their works at a profit. These hopes were duly realised. The new engineer, acting to a great extent under the orders of the Electricity Committee, was able to effect a number of economies. He at first received £400 a year by way of salary, this being £100 a year less than the salary paid to his predecessor. At the beginning of the present year he not unnaturally applied for an increase of salary; and his application for £100 more per annum was considered at the March meeting of the Corporation. At this meeting, a Mr. Rees Jones, who had recently become a member of the Corporation, made a speech in opposition to the proposal. Although certain other members of the Corporation were also in opposition, it was eventually agreed to make an increase of £50 per annum. Mr. Jones, who appears to have felt somewhat strongly on the matter, voiced his opinions once more at a Tariff Reform meeting. The connection between this subject and the fiscal question does not appear obvious, but that is by the way. In the course of this speech he was alleged to have uttered words which formed the subject-matter of Mr. Bache's action. According to the note of a shorthand writer, the speaker said: "These so-called economists, the Radicals, voted that one of the Corporation officials (meaning the plaintiff), who was already getting nearly £9 a week, should have another £1 a week. Eight Liberals were among the 12, as against eight Conservatives and three Liberals against. Five members of their so-called Ratepayers' Association voted for that official to get another £1 a week, although he was getting nearly £9 and had been cutting down the working men at the electrical works to the very bone." Assuming that these words were uttered, it is difficult to imagine a charge more likely to cause pain and annoyance to the "official" in question.

As counsel for the plaintiff observed to the jury, the *innuendo* clearly was: "Here is a man who does not get on with his employés; he deals unjustly, ungenerously, and illiberally with them, and he starves them by cutting down their wages to the lowest possible point." For any engineer to allow such an accusation to pass unchallenged would be fatal indeed. The defendant was asked to apologise, but did not do so, and in the result the plaintiff brought this action. There appears to have been some confusion in the mind of the plaintiff's solicitor (who was also chairman of the Lighting Committee) as to the persons against whom the attack was made, for in a newspaper letter written by him he described the speech as a slanderous charge against a set of business men, meaning the committee; but when he subsequently wrote on behalf of his client to demand an apology he received no reply. The case for the defendant, put quite shortly, was that he never uttered the words complained of. According to him it was the councillors who had voted for the increase of salary that he had been attacking, not the plaintiff. In giving his evidence he stated that he always thought that the plaintiff was a first-class man for the office, and that his only objection to his having a rise in salary was that several people at the works had had their wages cut down. He objected to economy on lines which were not right in order to increase the salary of a highly paid official. His reasons for not writing an apology were, in the first place, that he had nothing to apologise for, and in the second place, that he could not assent to the terms demanded. In the course of his summing up, Mr. Justice A. T. Lawrence said that it was for the jury to say, after hearing the evidence, whether the words in question had been uttered or not. Eventually, the jury found for the defendant.

It is difficult to restrain a feeling of sympathy for the plaintiff, who will have to bear the costs of the action. Even when one has regard to the attack which the defendant admits that he made—namely, an attack upon the Council for raising the salary of a man who had effected economies—the impression left on the mind is that he was levying a charge against the person most deeply interested in the proposed alteration. "You must not reward the man who has introduced measures of economy, because he has done so with the object of obtaining added emolument for himself." That would seem to be the meaning of the attack, if one is to give words their natural and ordinary interpretation. However, the jury thought otherwise; and in pronouncing their verdict for the defendant, they may have been influenced by a fact which was elicited in the course of the case—namely, that the damage of which the plaintiff complained was confined to his finding it difficult to obtain employment elsewhere. As a matter of fact, he had no intention of leaving his present appointment.

Passing away from the narrow and personal to the broader aspects of the case, what a vista it opens up from the point of view of the ratepayer! Here was a man who did excellent work; who turned a losing business into a prosperous concern; who effected, according to the evidence, a total saving of £700 *per annum*. His reasonable application for a small increase in salary is met with strenuous opposition; it seems that he was lucky in securing the paltry rise which was eventually awarded to him. From whence came the opposition? From those who objected to the discharge of superfluous hands at the central station, and (we presume) to the reduction of wages to what they ought to be. In our view, this is probably a concrete example of a force which is just beginning to make itself felt in municipal affairs. The vote of the rate-paid employé is becoming a matter of importance; and we are sorry to find that adherents of both the great parties in the State are nothing loath to court the suffrages of those who have both "vote and interest." Statistics recently collected, and given out at (of all places!) the Pan-Anglican Congress, show conclusively that the votes of municipal officials are by no means to be despised. It was there stated by Mr. E. Horace Green, that in Manchester the municipal employés were 15 per cent. of the municipal voters, while this class of person formed one-seventh of the municipal voters throughout the country. Would the municipal employé support the candidate who was pledged to municipal economy—to the reduction of wages—to the dismissal of superfluous workmen? The question admits of but one answer. Small wonder that the groan of the ratepayer is heard in the land, when men of the fibre of the plaintiff in the action under discussion are discouraged in the performance of their public duties.

But it is a hopeful sign that the advocates of municipal trading, as a means of providing work for the unemployed, were unsuccessful in this instance. It may be, and we cordially hope it is so, that there is a revulsion of feeling against this most insidious form of Socialism. We are glad to have had this opportunity of bringing this evil to the notice of the more intelligent of the rate-paying classes.

A Census of Production.

If there is one thing more than another that the British merchant or manufacturer dislikes it is the filling up of forms and the giving of information regarding his own business. It is satisfactory to note that this constitutional tendency has been recognised by the officials of the Board of Trade who are responsible for the preparation of the particulars required to be furnished under the Census of Production Act, 1906. The first leaf of the form—on which alone the name of the firm making the return appears—is perforated, and it is intimated that "this first leaf will be detached by a responsible officer of the department, and the other pages only (*with no indication of the name and address of the firm*) will be dealt with by the staff engaged in the work of compilation." There are other indications that the need for confidential treatment of the information, so far as individual firms are concerned, is thoroughly recognised and amply provided for. One of the natural—and perhaps the principal—objections to such returns is thus removed; but it cannot be expected that manufacturers will, even so, approach the preparation of the returns with any great enthusiasm. In some cases considerable work will be involved, and careful judgment will need to be exercised. The Act provides certain pains and penalties for any wilful neglect or inaccuracy in the returns, but we do not doubt that the electrical engineering trades will recognise the importance of the aggregate figures, and will seek to comply with the requirements of the Act not merely to the letter, but in the spirit.

That perfect freedom which characterises British trade and manufactures, and which has contributed in no small degree to their progress, unquestionably results in a lack of the statistical figures which are available elsewhere. The advantage of such figures is too obvious to need enlarging

upon, and we are glad to note the steps that are being taken by the Board of Trade under the Act of 1906, which provides for a census of production, whereby will be ascertained the net selling value of the outputs in a specified list of manufactures, the materials purchased, the number of persons employed on particular days, the days worked during the year, the capacity of the engines, and the quantity of electricity used. Supplementary questions, the answers to which are voluntary, cover the output for the preceding year, the quantity of copper used in the manufacture of cables, and the fuel consumed. "The questions in this part of the schedule have been submitted to the Cable-Makers' Association and to important firms representative of the different branches of the electrical engineering trades, and, as the desired details will be of much value in connection with the Census, it is hoped that there will be no unwillingness to give the particulars asked for." These additional questions are more simple, and the information desired is more readily obtained than the compulsory returns. We think the Board's hope that there will be no unwillingness to answer them will be shown to be quite justified.

A Contract to Supply Machinery.

The case of Ernest Scott & Mountain, Ltd., *v.* Kent Collieries, Ltd., the decision in which is reported elsewhere in this issue, raised certain interesting questions in relation to the supply of electrical pumping machinery. It appears that the defendants were minded to acquire pumps of sufficient capacity to keep a certain shaft free from water. For this purpose they ordered two sets from the plaintiffs. According to the specification each generator was to have an output of 300 K.V.A., and each engine was to have effective B.H.P. 400 and indicated H.P. 450, while the steam consumption was to be 28 lb. per KW.-hour. Machinery having been supplied in purported fulfilment of this contract, the plaintiffs sued to recover the balance of the price. The defendants contended that the machinery supplied did not conform to the contract, and sued for damages and for delay in delivery. The plaintiffs contended that, as regards the generators, the conditions were satisfied with an output of 255 KW., treating the kilowatt as equal to the kilovolt-ampere multiplied by a power factor of ·85, and that the specification would be complied with if the steam consumption was 28 lb. or 29 lb. per K.V.A.-hour. They also contended that, as regards the output of the motor, 272 H.P. with a capacity to develop up to 300 as a maximum, was sufficient. The Official Referee held that he could not adopt the plaintiffs' contention that the specified kilowatts were the equivalent of 300 K.V.A. multiplied by a power factor of ·85—that was to say, 255 KW., or that the steam consumption was to be 28 lb. per K.V.A.-hour.

The next contention of the defendants was that owing to the machinery not being in accordance with the contract, they were entitled to reject it *in toto*. Mr. Mackenzie, however, found that the machinery had been accepted and must be paid for, but that the defendants were entitled to set up in answer to a claim for the balance of the price, the difference between the value of the machinery supplied and the value which it would have possessed had it complied with the conditions. The next point was as to the capacity of the pumps. When run continuously day and night it was found that each of the motors as supplied became damaged through overheating. The plaintiffs contended that all they had undertaken to do was to supply motors which would run for six hours without overheating. Mr. Mackenzie held that this was the proper construction of the contract; but he also said, as if anticipating an appeal, that "If the right conclusion ought to be that the failure of the pumps to get below about 540 ft. without overheating owing to want of adequate ventilation were due to the plaintiffs' default, the defendants would have the right to claim, besides an abatement of the price, some reasonable compensation for the losses they incurred." As to steam consumption, he found that the machines as supplied required 38 lb. per KW.-hour, as against the 28 lb. contracted for, and that they were entitled to compensation on that head. In the event the plaintiffs succeeded on their claim after making various deductions, while the defendants had £1,117 on the counterclaim.

The most interesting point in this case, as it seems to us, is the question—What is meant by continuous running? The Referee apparently found that it here had a special meaning; *i.e.*, that it would run for six hours without overheating; but that was owing to a special agreement. The term "continuous running" therefore remains unexplained.

The I.M.E.A. Convention.

The thirteenth annual Convention of the I.M.E.A., now sitting at Nottingham, has been blessed so far with weather of the first quality, and in such a neighbourhood what time can be spared from the more serious functions should be most enjoyably occupied. Whatever may be said as to the limited hotel accommodation in Nottingham, the beauty of its surroundings is not to be gainsaid, and the excursion to Dovedale on Wednesday was delightful in the extreme. With such attractions in the way of hospitality, scenery, and solid instruction to offer, it is remarkable and regrettable that the membership makes no more progress, especially among the junior staffs. Out of some 800 possible Associates, but 40 have joined—the number is actually decreasing. No doubt the main reason is that given by Mr. Talbot in his Presidential Address — the assistants see no advantage to be gained by becoming Associates. We doubt, however, whether any improvement will result from his suggestion that committees should pay the expenses of their assistant engineers at the Convention; it is difficult enough to induce them to pay the expenses of the chief engineer, let alone his subordinates. The great benefits to be derived from the exchange of views and experiences with others are undeniable, and probably far exceed any to be drawn from the papers and discussions, which sometimes are hardly of that high order that might be expected from a gathering of chief engineers—a Council of All the Talents, so to speak (*pace* the 80 municipal undertakings not represented).

The closing paragraphs of Mr. Talbot's address call for a word of comment. He modestly attributes to the virtues of his committee the excellent results that have been attained by his electricity undertaking; but to our mind the wisdom of the committee has been manifested rather in the freedom accorded to its engineer, than in the exercise of its administrative powers. As long ago as 1901, we ascribed to this course the success that he had attained; we may repeat what we then said: "The secret of success in municipal electricity supply appears to reside in the adoption of this policy; get a good engineer, pay him an adequate salary, carry out his recommendations, and *let him alone!*" We believe this formula holds good now, as it did then; and the results may be seen, for example, at Nottingham. On the occasion to which we refer, we also remarked that the most prominent feature of the generating plant was its uniformity, a feature of which Mr. Talbot is justly proud; but whether his uniform success is due to the uniformity of his plant rather than to good management is not so certain.

The I.E.E. at Home.

On Tuesday last the Council of the Institution of Electrical Engineers was authorised by a unanimous vote to complete the purchase of the Medical Examination Hall on the Victoria Embankment, to provide a permanent home for the Institution. Some opposition was raised to the proposition, but this appeared to be due largely to the impossibility of making the members *au fait* with all the facts before the meeting, and we believe that eventually they will agree that the site is ideal, the building admirably adapted to the purposes of the Institution, and the action of the Council amply justified. We cordially congratulate the members on getting settled in life, and trust that we may hear no more of electricity being in its infancy! The contract was signed on Wednesday last.

D

THE SUB-STATION AT MANCHESTER EXHIBITION.

ON Tuesday next, July 7th, there is to be a Press inspection of the building that is being erected at Fallowfield for the approaching Manchester Electrical Exhibition. There are now three clear months before the date of opening, a period which ought to be ample for carrying through the large amount of work that still remains to be done. Between now and then most electrical men will be taking holiday, but those who are exhibiting doubtless have their plans well in hand already, and will see to it that at the last they are not behind-hand. At an exhibition that is to last only for a month we cannot afford to spend the greater part of the first week in a state of incompleteness. It would be an excellent thing if management, contractors and exhibitors could all co-operate in ensuring absolute readiness on the day of opening, so that this Exhibition may be a glorious exception to the general rule and, *inter alia*, may make the Machinery Hall at Shepherd's Bush to blush. It has frequently happened that for divers reasons some firms have not made up their minds to take space until the eleventh hour, or even after an exhibition has been actually opened, and the visitor has been edified with stand erectional operations. The halting exhibitor, in such a case, has nobody but himself to blame for the disadvantageous position in which he is placed. No-one in the electrical trade can advance the excuse that he did not know of the arrangements in time, for few events have been so much discussed and so persistently impressed upon the attention of everybody who reads the technical Press, and anybody who does not—well, as things go nowadays, when an electrical engineer gets out-of-date if he misses one issue of the ELECTRICAL REVIEW, he can hardly claim to be in the electrical trade.

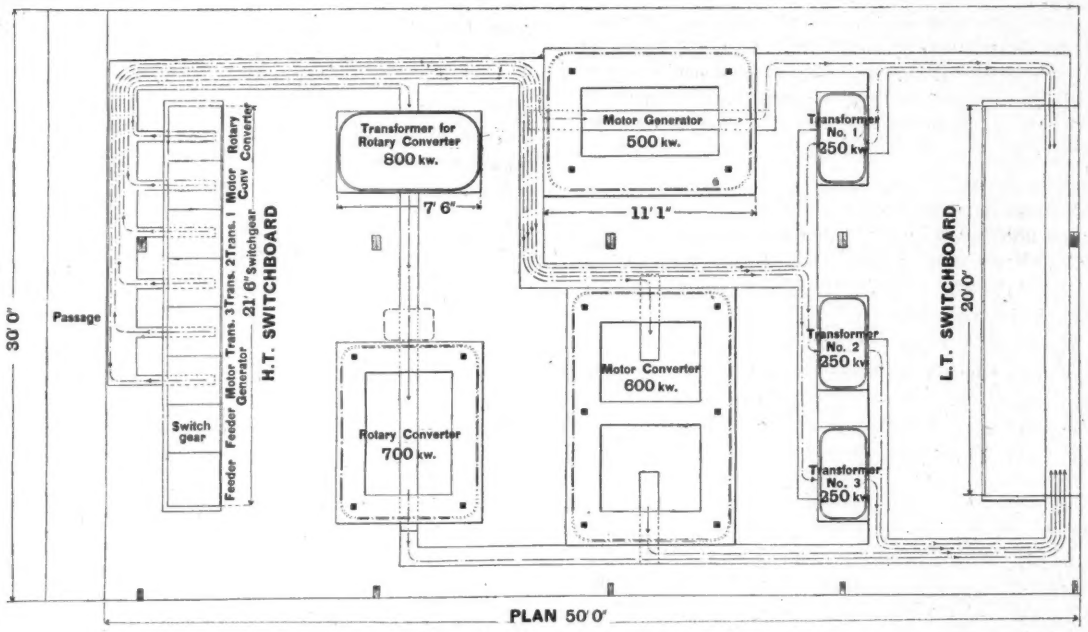
In connection with the progress that is being made with the undertaking, it will be timely if we place before our readers a few particulars—obtained recently in the course of an interview at the Exhibition Management Offices in London—regarding the arrangements that are being carried out for affording to exhibitors the requisite supply of electrical energy. In the accompanying drawing we give a plan of the sub-station and its equipment, which are being put down in the exhibition as a Corporation exhibit. The plant to be installed includes a 700-KW. Westinghouse rotary converter, together with its three-phase static transformer of 800-KW. capacity; a 600-KW. Bruce Peebles motor-converter; a 500-KW. induction motor-generator, supplied by the General Electric Co., Ltd.; three 250-KW. Westinghouse three-phase static transformers; Ferranti high and low-tension switchgear.

The primary high-tension voltage will be 6,500 between phases. The low-tension D.C. voltage will be 400 on the three-wire system, *i.e.*, 200 volts on either side of the middle wire. The low-tension voltage for three-phase supply will be 400 between phases, and the connection will be made to the neutral point of the transformers for giving an alternating lighting supply at approximately 240 volts. The whole of the converting plant is arranged for three-wire balancing.

For the benefit of those who have not yet lodged their applications for space, we would remind them that the offices of the Exhibition Management are at 2, Queen Anne's Gate, S.W., where all inquiries should be addressed.

THE COLLECTIVE ELECTRICAL EXHIBIT AT THE FRANCO-BRITISH EXHIBITION.

FRIDAY afternoon last witnessed the informal opening of the collective exhibit of the Electric Supply Companies of London, which occupies a prominent position in the British Machinery Section of the Franco-British Exhibition.



PLAN OF MANCHESTER EXHIBITION SUB-STATION.

Our readers will be aware that this matter of an exhibit of the more particularly domestic side of electric supply for some time hung fire, and it is, therefore, a matter for congratulation that in spite of delays, the display is of an interesting and fairly complete character.

The exhibit consists mainly of two buildings on either side of the central isle. One contains a large reception room, or information bureau, with a tasteful display of lamps, fittings, fans, &c., and suitable literature in pamphlet form for the information of inquirers; the other comprises a model house furnished by Messrs. Waring & Gillow, and provided, of course, with an up-to-date electrical equipment, not the least important part of which is in the kitchen. This house was wired by Messrs. W. Leonard & Co., the apparatus having been supplied by Messrs. Rashleigh, Phipps & Co.

A certain number of individual firms are also showing their specialities, spaces being reserved for this purpose at either end of the main buildings.

Thus, at one end of the reception building the Dowsing Radiant Heat Co. has a large display of heating and electro-medical apparatus, while the Edison & Swan Co., with carbon, metal-filament and arc lamps, fittings, switches, &c., Messrs. Berry, Skinner & Co., and the Linolite Co., are also in evidence both inside and outside the bureau.

Similarly on the other stand, Electromotors, Ltd., show several applications of their motors, many of which are used for driving machinery in other parts of the Exhibition; the stand also contains two 13-KW. motor-generators for supplying energy to the collective exhibit; the Adams Manufacturing Co. have a variety of their well-known switches and controllers on view, while the B.T.-H. Co. and Messrs. C. C. Hawkes, Ltd., show heating and cooking apparatus. Messrs. Reyrolle & Co. show on a side stand two specially interesting ironclad switch panels of self-contained design, suitable for H.T. generating and sub-station work, and similar to those largely employed in power distribution work on the Tyneside; this firm is also showing a variety of switchgear and accessories on one of the central stands.

The Westminster Engineering Co. specialises, among other things, in photographic arc lamps, a high voltage pattern of which will attract attention, as also will the "Westminster" limit switches and flame arcs.

Automatic electric signs and flashes by the Imperial Lighting Co., and a model Waygood lift are also attractive features on this stand.

While the better known metallic-filament lamps are conspicuous by their absence, it is a matter of satisfaction that such well-known English lamp-makers as the Edison and Swan and Sunbeam Lamp Companies are showing their efforts in this direction, and that the Stearn Electric Lamp Co. is showing its latest "series" metal-filament lamps.

Space prevents us making more than a passing reference to the exhibits on the present occasion, but many other well-known firms, including Messrs. Veritys, Messrs. Bergtheil and Young, Messrs. A. P. Lundberg & Sons, the Birmingham Guild of Handicraft, and the Reason Manufacturing Co., have contributed to the success of the show in their own special spheres.

In conclusion, we must congratulate those at the helm on having obtained such a satisfactory result, the exhibit as a whole containing much that will interest and educate the general visitor to the Exhibition.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The British Electrical Industry.

Some few months back I had the pleasure of writing you on the subject of electrical manufacturers' co-operation, which you very kindly published in your issue of November 8th last. As I have not seen any further discussion on the subject of a combine amongst manufacturers with a view to maintaining high prices, I assume that the movement has found a natural death—the only possible ending to such a scheme.

The letter to which I have made reference contained a few remarks anent the lamentable condition of affairs as regards the telephone industry in Great Britain, and the apparent inability of home manufacturers to keep in line with their foreign competitors in this particular branch of industry. I now see from the various technical papers which reach me from time to time, that one of the large manufacturing concerns at home have recently made a very bold bid for a share of the trade in the manufacture and equipment of large telephone installations, and that their progressive policy has already been partly rewarded, as they have received one large municipal contract which, doubtless, in the ordinary course of events would have gone either to Sweden, the States or Germany.

This fact has given me the very keenest pleasure, and is, without doubt, the commencement of a new era in the history of the telephone industry, the past history of which has been anything but satisfactory. I cannot help feeling most firmly convinced that the progressive policy of this manufacturing firm is the antidote to bad trade rather than the "protection" about which we hear so much. It seems to me a parallel case with that of the two commercial travellers; the one who sat in his hotel bemoaning his luck, the state of trade and the number of his competitors, whilst the other, with greater energy, sought his customers, gained and lost business, but always in the end secured his share.

I do not doubt that we shall shortly see further important developments in British telephones, to be followed, let us hope, by similar progress in the allied industries. There is plenty of room for improvement, as can quickly be seen from a glance at the Board of Trade monthly export statistics, which appear in the REVIEW from time to time, and which go to show that our average monthly total exports are not more than about £160,000, which is very much lower, I venture to think, than it should be when it is remembered that British capitalists have so many millions of pounds sterling invested in the Colonies and abroad in railways, tramways, power schemes, mines, &c., all of which are large consumers of electrical plant. It seems apparent that these companies place a large portion of their plant orders abroad, either because they cannot obtain the same at home on equal terms or, as I believe to be more probable, they cannot get the same satisfaction generally.

Large sums of British money find their way into the factories of our foreign friends for work which could and should be successfully carried on at home, and for this reason it is to be sincerely hoped that the day is not far distant when we shall regain the ground which has been lost, and take the same prominent lead which our countrymen have secured and maintained in so many other important industries, to their great credit.

Adelante.

Buenos Ayres, *May 25th*, 1908.

Live Steam Heating.

Referring to your contributor's article on this subject, it may be pointed out that it is just as irrational to attribute a loss of efficiency to live steam heaters as to claim an increase.

The live steam heater certainly puts no heat into the boiler that has not come from the boiler; so, unless, under equal conditions of firing, its use varies the temperature of the escaping gases, it can have no effect one way or the other.

It is very easy to ascertain both the furnace temperature and the escaping gas temperature, and to verify that the live steam heater has no effect on either.

The exhaust steam heater, of course, has a totally different effect; it returns to the boiler latent heat from exhaust steam otherwise wasted, and so cannot fail to make a real fuel saving or increase of steaming duty, under any given firing conditions.

Erith's Engineering Co., Ltd.

London, E.C., *June 26th*, 1908.

Conditions of Employment.

I notice in your issue of the 19th inst. an account of Messrs. Holmes & Co. giving an outing to their employés.

It is such little acts as these which make the employés feel that their efforts are appreciated, and add a stimulus which is far-reaching in effect.

How very different to the way a certain firm of engineers in the Midlands goes to work! After paying 15 per cent. every year the directors pat themselves on the back, but when it comes to considering the employés who have worked hard to help to get this result, they treat them with absolute indifference; and, further, try to hinder them from getting a living by endeavouring to bind them down under what they are pleased to call an agreement?

They contract with a man for, say, three years, during which time he must devote himself solely to the business of the company, and must not be in any way connected with any other company; and before leaving must give three months' notice, they on their part reserving the right to dismiss him at a moment's notice, if in the opinion of the managing director he is not competent, which means that should they for any reason require to replace him, it is a very simple matter to do so. Then the man must not enter the employment of a competitive firm for a period of three years after the agreement has expired. All this might be tolerated if there were compensating advantages in the matter of salary, but this is apparently out of the question.

A number of cases have come to my notice where the

employés have been dismissed because they would not sign this agreement, and I think they were quite justified in the action. Any respectable firm would have no hesitation in engaging them if they knew the circumstances, I feel sure, although their employers might refuse them a reference.

I would suggest to these engineers that they might take a leaf out of Messrs. Holmes's book, which would, I feel sure, be to the mutual advantage of all concerned.

T. A. L.

[The agreement outlined by our correspondent savours of the feudal ages; no man should be asked to accept such one-sided terms, which place him entirely at the mercy of his employers. But there may be something to be said on the other side of the question.—Eds. E.R.]

Working Speed in Telegraphy.

Mr. Raymond-Barker takes exception to my remark that "the duplex-automatic system is, for long distances, only applicable to wire telegraphy at present," and says that "radio-telegraphy can justly claim to have progressed considerably further towards perfection than these words would lead one to suppose."

He goes on to say (1) that "automatic transmission is already in use for wireless," and (2) "secondly, as regards duplex, this has already been effected." I was aware of both these facts. Mr. Raymond-Barker, however, omits to mention the distances at which the duplex-automatic system is in successful practical operation with wireless telegraphy—which is, after all, the only point at issue. But perhaps this is because he is conscious that I have already supplied the necessary information in the *Times* Engineering Supplement of February 12th.

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Westminster, *July 23rd.*

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LEGAL.

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The description of the machinery ordered was contained in a specification submitted by the plaintiffs, dated December 14th, 1905, the construction of which was one of the chief issues in the case. Plaintiffs alleged that they had complied with its terms, while the defendants denied this. It provided *inter alia* that each generator should have an output of 300 K.V.A., and, as regards each engine, 400 effective B.H.P., 450 indicated H.P., and 28 lb. steam consumption per KW.-hour. Each pump was to be driven by a three-phase motor developing up to 300 H.P. at 1,440 R.P.M., and was to be capable of raising 1,000 gals. of water per minute against a head of 640 ft., with a speed of 1,440 revolutions per minute. Plaintiffs contended that, as regarded the generators, the conditions were satisfied with an output of 255 KW., and that the specification would be complied with if the steam consumption was 28 lb. or 29 lb. per K.V.A.-hour, treating the kilowatt as equal to the kilovolt-ampere, multiplied by a power factor of ·85, and as regarded the output of the motor, that 272 H.P., with capacity to develop up to 300 H.P. as a maximum, was sufficient. Defendants contended, on the other hand, for an output of 300 KW., with a steam consumption of 28 lb., and an output from the motor of 300 B.H.P. under ordinary working conditions. Applying the principles laid down in the case of the Bank of New Zealand *v.* Simpson, the Official Referee said he was bound to look at all the facts, so as to ascertain the meaning of the words and phrases used. After giving weight to all the evidence, he could not adopt the plaintiffs' contention that the specified kilowatts were to be the equivalent of 300 K.V.A., multiplied by a power factor of ·85—that was to say, 255 KW.; or that the steam consumption was to be 28 lb. per K.V.A.-hour. If the plaintiffs had so intended, they should have made it clear in their last tender. He, therefore, held that the generators to be supplied should have had an output of 300 KW. each, and the steam consumption was not to exceed 28 lb. per KW.-hour. As to the motors, the development of power up to a maximum of 300 B.H.P. was guaranteed, but if the required work could be done with a smaller normal B.H.P., the terms of the contract would have been satisfied. That was sufficient to dispose of the main point of the defendants' claim to be reimbursed the losses incurred by the failure of the pumping machinery. The next question was whether the pumping machinery was according to the specification. 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The case was thus one to which the following provisions of the Sale of Goods Act applied:—Sec. 11: (1) (c) Where the contract of sale is not revocable, and the buyer has accepted the goods, or part thereof, or where the contract is for specified goods, the property in which has passed to the buyer, the breach of any condition to be fulfilled by the seller can only be treated as a breach of warranty, and not as a ground for rejecting the goods and treating the contract as repudiated. Sec. 53: (1) Where there is a breach of warranty by the seller, or where the buyer elects, or is compelled to treat any breach of condition on the part of the seller as a breach of warranty, the buyer may set up against the seller the breach of warranty in diminution or extinction of the price, or may maintain against the seller an action for damages for the breach of warranty. (2) The amount of diminution damages for breach of warranty is the estimated loss directly and naturally resulting in the ordinary course of events from breach of warranty. (3) In the case of a breach of warranty of quality such loss is *primâ facie*, the difference between the value of the goods at the time of delivery to the buyer, and the value they would have had if they had answered the warranty. Sec. 54: Nothing in this Act affects the right of the buyer to recover special damages in any case where by law special damages may be recoverable. The defendants, continued the learned Referee, were clearly entitled to set up, as against the claim of the plaintiffs for the balance of the contract price of the machinery, that they were entitled to a diminution of the price equal to the difference between the value of the thing supplied, and the value which they would have had if the conditions which were not fulfilled, had been fulfilled. The next questions to be dealt with, were the claims of defendants to damages. The first claim was for damages for delay in delivery of the machinery. Having regard to the correspondence between the parties, which he (the learned Referee) had closely read, and very carefully considered, and having regard to all the circumstances of the case, he found that though there was delay in delivery, the defendants suffered no damage thereby, since their appliances were not in a fit condition, and were not ready to set the plant at work before it did actually arrive. The next claim, and the most serious one, was for the loss sustained in consequence of the failure of the pumps during the latter part of 1906. The early negotiations and correspondence showed that the plaintiffs contemplated and advised the defendants that the two pumps should be put into the shaft together, and worked alternatively. In his opinion the defendants' gear and appliances were not fit, however, to adopt this method, and only one pump at a time could be lowered into the shaft, so that if that broke down or failed, it had to be lifted out and the other one lowered by the same appliances, in each case a lengthy operation and one which involved the rising of the water in the shaft. Having detailed the breakages and stoppages which had occurred, the learned Referee pointed out that the defendants' claim was that these stoppages and breakdowns had occurred because the machinery of each pump was not capable of pumping 1,000 gallons per minute at a head of 640 ft., and this contention was supported by the test which was made in 1908. This test, it was contended, showed that the pump could not do its work owing to over-heating due to insufficient ventilation. On this part of the case, although the output of the generator was 255 KW., instead of 300 KW., their output was sufficient for the work they had to do. He found this on the evidence, but it seemed to follow from the fact that the generators supplied sufficient power to work No. 3 pump satisfactorily. Each of the pumps Nos. 1 and 2, as driven by the motors, was capable of raising 1,000 gallons of water at a head of 640 ft. with 1,440 R.P.M., but neither of the pumps, if worked night and day continuously, in the manner in which they were worked by the defendants, could by itself get down as far as 640 ft. and from that depth raise 1,000 gals. of water per minute. The plaintiffs argued that the motors were not designed so that each of them should be capable of running by itself continuously for a long period at the maximum load without overheating. This was supported by the passage in the specification, which, in effect, as far as the generators were concerned, guaranteed a full output for a continuous run of six hours without overheating. In his opinion, the defendants were not under any obligation to put both the pumps into the pit simultaneously and work them in the manner suggested by the plaintiffs. Having, however, decided not to do so and to try and unwater the pit with one pump only, they could not recover damages for the loss occasioned by each pump breaking down except in so far as the breakdown was due to the plaintiffs' default, and the losses which the defendants were seeking to make the plaintiffs liable for were not, as he found, except to a certain extent, due to the plaintiffs' failure to make the electrical pumping machinery conform in all respects to the conditions of the contract. He ought, however, to add that if the right conclusion ought to be that the failure of the pumps to get below about 540 ft. without overheating owing to want of adequate ventilation was due to the plaintiffs' default; the defendants would have the right to claim, besides an abatement of the price, some reasonable compensation for the losses they incurred. With regard to the claim for coal consumption, he found that the steam consumption per KW.-hour was 38 lb., as against 28 lb. guaranteed, The engine was, therefore, less valuable to the defendants than an engine conforming in this respect to the contract would have been. In respect of this failure of the plaintiffs to comply with the contract, the defendants were entitled to damages. They claimed the estimated excess of coal consumption when the plant was at work over the coal consumption guaranteed, and for the quantity used by the plant when at work without producing useful results. That, in his opinion, was not the right measure of compensation, and he decided that the right measure was to award such sum as one could estimate to be the difference in the value of the engine as delivered, and an engine with the guaranteed steam consumption. He, therefore, took the basis of the plaintiffs' claim, and he awarded them the balance of £2,943 6s. On defendants' counterclaim he disallowed £30, because he was unable to find that those expenses had been incurred by any breach of the contract expressed or implied. But defendants had also a claim for £375 in respect of No. 3 pump, but this, he held, failed. Plaintiffs had delivered the plant which was less valuable to the defendants than if it had conformed to the contract, and he allowed them in this item £417. He also assessed them the sum of £700 on the contract. Defendants were, therefore, entitled to reduce the claim of plaintiffs by the sum of £1,117, and deducting that sum from the £2,943 6s., he gave judgment for plaintiffs for £1,826 6s. Defendants had succeeded in some of the issues, but it was very difficult to separate them, and if it was convenient for the parties on both sides, he would hear an application with regard to costs at a future date.

Counsel agreed to this, and the arrangement was acceded to.

In the Official Referee's Court of the High Court of Justice, before Mr. Muir Mackenzie, on Monday, this case again came up, the parties having to decide the question of costs.

employés have been dismissed because they would not sign this agreement, and I think they were quite justified in the action. Any respectable firm would have no hesitation in engaging them if they knew the circumstances, I feel sure, although their employers might refuse them a reference.

I would suggest to these engineers that they might take a leaf out of Messrs. Holmes's book, which would, I feel sure, be to the mutual advantage of all concerned.

T. A. L.

[The agreement outlined by our correspondent savours of the feudal ages; no man should be asked to accept such one-sided terms, which place him entirely at the mercy of his employers. But there may be something to be said on the other side of the question.—Eds. E.R.]

Working Speed in Telegraphy.

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He found this on the evidence, but it seemed to follow from the fact that the generators supplied sufficient power to work No. 3 pump satisfactorily. Each of the pumps Nos. 1 and 2, as driven by the motors, was capable of raising 1,000 gallons of water at a head of 640 ft. with 1,440 R.P.M., but neither of the pumps, if worked night and day continuously, in the manner in which they were worked by the defendants, could by itself get down as far as 640 ft. and from that depth raise 1,000 gals. of water per minute. The plaintiffs argued that the motors were not designed so that each of them should be capable of running by itself continuously for a long period at the maximum load without overheating. This was supported by the passage in the specification, which, in effect, as far as the generators were concerned, guaranteed a full output for a continuous run of six hours without overheating. In his opinion, the defendants were not under any obligation to put both the pumps into the pit simultaneously and work them in the manner suggested by the plaintiffs. Having, however, decided not to do so and to try and unwater the pit with one pump only, they could not recover damages for the loss occasioned by each pump breaking down except in so far as the breakdown was due to the plaintiffs' default, and the losses which the defendants were seeking to make the plaintiffs liable for were not, as he found, except to a certain extent, due to the plaintiffs' failure to make the electrical pumping machinery conform in all respects to the conditions of the contract. He ought, however, to add that if the right conclusion ought to be that the failure of the pumps to get below about 540 ft. without overheating owing to want of adequate ventilation was due to the plaintiffs' default; the defendants would have the right to claim, besides an abatement of the price, some reasonable compensation for the losses they incurred. With regard to the claim for coal consumption, he found that the steam consumption per KW.-hour was 38 lb., as against 28 lb. guaranteed, The engine was, therefore, less valuable to the defendants than an engine conforming in this respect to the contract would have been. In respect of this failure of the plaintiffs to comply with the contract, the defendants were entitled to damages. They claimed the estimated excess of coal consumption when the plant was at work over the coal consumption guaranteed, and for the quantity used by the plant when at work without producing useful results. That, in his opinion, was not the right measure of compensation, and he decided that the right measure was to award such sum as one could estimate to be the difference in the value of the engine as delivered, and an engine with the guaranteed steam consumption. He, therefore, took the basis of the plaintiffs' claim, and he awarded them the balance of £2,943 6s. On defendants' counterclaim he disallowed £30, because he was unable to find that those expenses had been incurred by any breach of the contract expressed or implied. But defendants had also a claim for £375 in respect of No. 3 pump, but this, he held, failed. Plaintiffs had delivered the plant which was less valuable to the defendants than if it had conformed to the contract, and he allowed them in this item £417. He also assessed them the sum of £700 on the contract. Defendants were, therefore, entitled to reduce the claim of plaintiffs by the sum of £1,117, and deducting that sum from the £2,943 6s., he gave judgment for plaintiffs for £1,826 6s. Defendants had succeeded in some of the issues, but it was very difficult to separate them, and if it was convenient for the parties on both sides, he would hear an application with regard to costs at a future date.

Counsel agreed to this, and the arrangement was acceded to.

In the Official Referee's Court of the High Court of Justice, before Mr. Muir Mackenzie, on Monday, this case again came up, the parties having to decide the question of costs.

Mr. Russell, K.C., who was counsel for plaintiffs, now submitted that plaintiffs had been perfectly justified in bringing their action, and therefore they were entitled to the costs. The defendants had put forward an enormous counterclaim, and the only figure they had recovered on which they could get costs was a sum of £417, therefore plaintiffs should have all the costs of the action, excepting as regarded that sum. Mr. Russell read a letter which had been written by the plaintiffs to defendants during the progress of litigation, stating that they were prepared to give £2,000 as an allowance to be accepted by defendants, each party to pay their own costs. In reply to that letter, counsel said, defendants' solicitors wrote stating that the offer was wholly inadequate, and the only basis upon which their clients could consider the matter would be that the defendants should keep No. 3 pump and set off the amount of the generating plant against an amount to be discussed and arranged. Having regard to that letter plaintiffs had no option but to fight the counterclaim.

Mr. Bousfield, K.C., said it was an extremely bad precedent to bring forward such letters of compromise when the question of costs was being considered. The action had been brought for seven days when the letters were written, and defendants could not have replied otherwise. The Official Referee had found in substance not only that the machinery was not according to contract, but having regard to the amount he had allowed off the price, he had found in defendants' favour that there was very considerable lack of conformity with the contract.

The Official Referee declared that the costs would follow the event. In that case plaintiffs would get the costs of the action just as if there had been no counterclaim at all. He directed the costs of the counterclaim, half of which would be awarded to the defendants, to be taxed, and the amount deducted from plaintiffs' costs. The Official Referee refused to grant a stay of execution, as it was not, he said, for him to do so.

OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"Anxious" writes:—"Could you kindly give me any information on the following:—A town had a Provisional Order in 1903. This year it has been revoked by the Board of Trade. The town has since purchased the gas undertaking from a company. There is now a movement on foot for the formation of an electric light and power company. I presume that application must be made to obtain the Council's permission, and that they would oppose the scheme. Have they power to prevent a company being formed, having allowed their order to lapse?"

*** There is not the slightest necessity to apply to the Town Council for permission to start an electric light and power company, unless, of course, the company requires a Provisional Order. In that case, by virtue of the Electric Lighting Act, 1888, Sec. 1, the consent of the local authority must be obtained, unless the Board of Trade see fit to dispense therewith. It is more than likely that they would see fit to take this course in a case where the local authority had themselves obtained a Provisional Order and had allowed it to lapse. It should be observed, however, that the necessity for obtaining a Provisional Order will only arise if the company requires power to break up streets for the purpose of laying cables. Such work cannot, generally speaking, be undertaken without the consent of the local authority concerned.

PARLIAMENTARY.

Electricity Supply Bills.

Thursday, June 25th.

Mr. Bushe, K.C., opened the case for the London (Westminster and Kensington) Bill. Counsel said that the whole of the object of their Bill was covered by the decision come to by the Committee in the case of the London Joint Committee Bill—that was to link up the stations with one another to give a supply of electrical energy to each other. They attached great importance to the passing of their Bill, and if their Lordships passed it, it would be a valuable instrument in their hands to carry on their work. The four companies who proposed to link up—the Kensington, the Notting Hill, St. James' and Pall Mall and the Westminster Electric Companies—were situated in the Boroughs of Kensington or Westminster. The powers exercised by the four companies were composed in a provisional order and an Act, and those powers authorised the construction of steam electric generating stations. Up to the year 1899 the companies worked individually, Parliament not recognising combination or association, with the result that the companies were subjected to inconvenience and restrictions which hampered their progress. They were there that day to ask their Lordships to remove the restrictions under which they had been working, and to allow combination and association between the four companies. In the year 1899 Parliament relaxed their stringency to an extent and allowed the four companies to unite into two groups of two, and each of those groups had now a generating station outside its own area. The Westminster and the St. James' and Pall Mall Companies took a supply from the Central Supply Co., which was really a subsidiary company of those two, from their station at Marylebone. The energy was conveyed from there by high tension mains down to the separate company's station, and was there transformed to low pressure, joining with the current generated at the steam-electric generating station and sent down the mains in the ordinary way. The other two companies—the Notting Hill and the Kensington—had a station at Wood Lane, Hammersmith, from which they took their energy. The result of that combination had been entirely satisfactory. The object of the present Bill was simply to carry that association further. Where there were now two groups, they wanted to make one of the four companies, and if that Bill were passed that object would be accomplished. It would tend to economy, and would, therefore, be to the public interests.

Answering the Chairman, Mr. Bushe said it was true they were included in the schedule of the Joint Committee's Bill, but they wished to have their Bill in case the other one should not, for any reason, be proceeded with. It was quite within the power of the Joint Committee to say "you have not paid any of the costs of promotion, and we will, therefore, strike you out."

Mr. L. H. Horndern, general manager of the Westminster Electric Supply Corporation, and joint manager at the Wood Lane station, corroborated counsel's statement. He said there was no reason to suppose other than that at some future date they might join with the Joint Committee.

In answer to Mr. Freeman, K.C., representing the L.C.C., Witness admitted that he had never known of Parliament passing a Bill authorising a particular scheme when that object was already contained in another Bill.

Replying to the Chairman, Witness said that they wanted their Bill in case the other Bill was not proceeded with. It was true that they had all they wanted under the other Bill. He did not think the shareholders would agree to combining with the other companies.

By Lord Lytton: Their Bill was a standby in the event of anything happening to prevent the passage of the other Bill, or in case they were cut out of that measure. If they were not cut out, of course their Bill would not be required.

Mr. Bushe said it would be disastrous for them if their Bill was not allowed to proceed and they were cut out of the other measure. He most earnestly asked the Committee to pass his Bill.

Mr. Freeman, K.C., opposed the measure on the ground that it was contrary to Parliamentary practice to pass a Bill as a standby in the event of another one failing. That Committee had passed a Bill which admittedly covered the ground which would be covered by the measure now before them if it became law. There was nothing even now to prevent those companies associating with the other promoters of the other Bill—they could do it at once if they chose. He submitted that the Bill was totally unnecessary. The promoters had taken advantage of the other Bill up to a certain point—they had not opposed it. As he had said, it was contrary to Parliamentary practice to pass two Bills covering the same object; let the promoters be reasonable and support the other Bill.

After consultation in private,

The Chairman announced that the Committee were of opinion that the Bill might proceed, but it must be understood that the clauses would have to be practically identical with those of the Joint Committee Bill.

Monday, June 29th.

On Monday Lord Cromer's Committee sat to consider clauses in the London and District Electricity Supply Bill.

Mr. Balfour Browne, on behalf of the London Electric Supply Bill, said they did not intend to take part in the discussion on clauses.

Mr. Bushe stated that a similar course would be followed by the Westminster and Kensington Companies.

Numerous amendments to clauses, or new clauses, were then considered. In very many cases they were rejected. On Tuesday the consideration of clauses was continued.

The Electrical Industry and the Port of London Bill.

On Tuesday the Joint Committee of the Houses of Lords and Commons, considering the Port of London Bill, heard evidence from Mr. Alexander Siemens, a director of the firm of Messrs. Siemens Bros. & Co., Ltd. He supported the case put forward by the London Waterside Manufacturers' Association, which is representative of all the waterside manufacturers in the Port of London. Mr. Siemens, who is a member of the Council of the Association, informed the Committee that the rateable value of his premises by the waterside was between £9,000 and £10,000. He was emphatically of opinion that the waterside manufacturers ought to have the certainty of some representation on the Port authority. The latter body ought to have such knowledge as only the manufacturers could give them when fixing rates, &c. Mr. Siemens endorsed evidence that the rateable value of the waterside manufactories represented by the Association was nearly half-a-million, and the industries gave employment to about 70,000 people. Cheap transport was essential to the large manufacturing industries. It was of great importance to the welfare of London that the waterside industries should be represented on the new Port authority. The Association was satisfied with the present condition of affairs. At present they were able to hold their own with foreign competitors,

because they had a free port. Many materials were bought by waterside manufacturers from merchants in London, who, paying the dues, would, therefore, get the vote for representation instead of the waterside manufacturers. Their interests ought to be protected against foreign competition. Mr. Siemens emphasised the fear of manufacturers and industry being driven away if heavy and ill-considered charges were imposed.

Second and Third Readings.—In the House of Lords on Tuesday, the Ayr Corporation Tramways Order Confirmation Bill was read a third time and passed; the Paisley District Tramways Order Confirmation Bill was read a second time.

In the House of Lords on June 25th, the North-East London Railway Bill was read a third time and passed.

Macclesfield and District Tramways Bill.—On Thursday, June 25th, this Bill came before the Unopposed Bill Committee of the House of Commons, and the preamble was declared proved. The object is to authorise the Macclesfield Tramways Co. to abandon the works authorised by the Act of 1906, except certain tramways situated within the urban districts of Hazel Grove and Bramhall, which tramways have been invested in the urban district councils. The company will be dissolved under the powers contained in the Bill.

Bristol Tramways Bill.—This Bill came on Thursday, June 25th, before the Unopposed Bill Committee of the House of Commons, presided over by Mr. Emmott. The object of the Bill is to extend the time for the completion of tramways authorized in 1904. The Parliamentary Agent submitted an amendment suggested by the Speaker's Counsel, but the Committee passed the Bill unamended.

Tramway Accidents.—In the Parliamentary Papers, Mr. Harwood asks the President of the Board of Trade if he can state how many persons have been run over by tramcars during the past 12 months, or for any shorter period. Mr. Churchill states, in reply, that the following had been reported to the Board of Trade for the year ending April 30th last:—Number of accidents, 1,329; persons killed, 105; injured, 1,003; uninjured, 221.

West London, Barnes and Richmond Tramways Bill.—It is announced that this Bill has been withdrawn. The object was to incorporate a company with a capital of £240,000 and to construct about seven miles of tramway in the district of Barnes and Richmond.

The District Railway Sliding Doors.—In the Parliamentary questions last week, Mr. Byles referred to the danger of the sliding doors on the District Railway, and asked whether the Board of Trade proposed to take any action in the matter. He was informed in reply that the railway company were preparing to change all the present pneumatic apparatus controlling the movement of the doors, so that the doors can be worked by hand.

THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION.

After a lapse of only four years, Nottingham once again becomes the scene of a Municipal Electrical Convention, the thirteenth annual meeting of members of the Municipal Electrical Association having been inaugurated in that city on Tuesday last. Fortunately this year's proceedings are being favoured with summer weather, in marked contrast to the extraordinary climatic conditions of 1907.

The proceedings commenced at the University with a civic welcome by the Mayor of Nottingham (Mr. Councillor Spalding), who, in the course of his speech, remarked on the numerous gatherings of a similar character, of which his city would be the scene during this year, and of which the present was by no means the least important. Nottingham was, he considered, fortunate in its engineer; his department was a most successful one, and had contributed handsomely to the rates. His welcome was ably seconded by the Sheriff, Mr. Councillor Carey.

Mr. H. Talbot, the President for the year, then read his address, which is dealt with below, after which Bailie Murray, convener of the Edinburgh electric lighting department, moved a special vote of thanks, at the same time pointing out that the address touched on one or two debatable points.

Bailie Wightman's paper, dealing with his experiences in establishing the Govan electricity undertaking, and the discussion—or shall we say enlargement?—of it by Brother Chairmen, both English and Scottish, occupied the remainder of the morning.

With the Bailie's paper we deal elsewhere (p. 34). Alderman Pearson (Bristol), who opened the discussion, created considerable amusement by suggesting that the "kindred spirits" with which the Bailie mentioned it had been his privilege to forgather for so many years, must have been essentially Scotch. With legal caution, he refrained from absolutely committing himself to the assertion that Govan would have been better off electrically under Glasgow's wing, although he obviously favoured that idea. From experience, he advocated a bold course in matters of electric supply, and pleaded, rightly, for reasonable continuity in office of chief officials of electrical undertakings.

Bailie Finlay (Glasgow), in the course of some pointed remarks on that enterprising city, hinted that the Kelvinside generating station (which the city apparently took over when its original owners were faced with financial suicide) was kept as a sort of museum for the express purpose of overawing refractory neighbouring burghs, which persisted in refusing the Glasgow E.L. Department's welcome and started "on their own."

Councillor Sinclair (Swansea) pleaded for more Conveners and Bailies to come forward with past experiences; Alderman Smith (Liverpool), Bailie Murray (Edinburgh), Alderman Coates (Hanley), and Bailies Jackson (Partick) and Fisher (Paisley) obliged on the spot.

With Alderman Coates's remarks we cordially agree, he pointing out that small electricity supply stations without a day load could rarely pay their way, and evidently he regretted the existence of so many small central stations in the Potteries area, when one larger station might have successfully dealt with the whole.

At the invitation of the chairman and members of the Nottingham Electricity Committee, the members of the Association were subsequently entertained to luncheon at the Mechanics' Hall. The afternoon was devoted to sight-seeing at the Corporation's power stations and car depôts, &c.

On Wednesday an enjoyable excursion to Dovedale, one of the most charming localities in Derbyshire, was planned, luncheon and tea being provided at the Peveril Hotel; while yesterday was wholly devoted to business, the annual general meeting being held in the morning, and papers on generating station design and the reconstruction of an electric lighting scheme being read and discussed in the afternoon. In the evening the annual dinner was to be held in the Exchange Hall.

The business of the Convention finishes to-day with the reading of papers on alternating-current accumulator sub-stations and on the work of a testing department.

In addition to the municipal electrical stations at Nottingham, the generating stations of the Derby Corporation and the works of the Brush Electrical Engineering Co., the British L.M. Ericsson Telephone Co. and the D.P. Battery Co. are open to the visitors during their stay.

Mr. Herbert Talbot opened his Presidential Address on the key-note of equitable charges for an efficient and cheap supply of electricity; we hope he is not the prophet of a lost cause, but it is certain that flat rates and sliding scales, both of which he condemned, are gaining ground at the expense of the maximum demand system. While the offer of a flat rate as an alternative to the maximum demand really stultifies the latter altogether, depriving it of the opportunity of exercising its legitimate function, the combination has become very common—possibly, in many cases, as a preliminary to the total abandonment of the M.D. system. At Nottingham, however, the latter is in force for lighting pure and undefiled, and from the data given by the President it appears to have operated very satisfactorily.

The fact that it affords no means of discriminating between consumers who use their maximum demand respectively on and off the peak is regarded by Mr. Talbot as of very slight importance; it is, however, an incurable defect in the system, increasing in importance with the development of the power load.

The complete failure of the Council's efforts to induce assistant engineers to join the Association is noticed by the President—this year not a single paper has been received from any Associate, in spite of the travelling studentships

offered for competition, and the number of Associates has actually diminished. Mr. Talbot attributes their shyness to their inability to attend the Convention, while they can read the papers and discussions at leisure. To remedy this backwardness, he suggests that their expenses should be paid by the Committees, who would be the gainers, as the assistants would become more useful.

The arrival of the metallic-filament lamp inevitably receives attention in the Address; Mr. Talbot considers it impossible to predict their ultimate effect upon electrical undertakings, but somewhat discounts this remark by proceeding to forecast a temporary reduction of revenue, followed by a larger output in the near future, the contractors for electrical plant being the losers for a time, due to the postponement of extensions.

Turning to the announcement that the Corporation of Birmingham is going to register wiring contractors, Mr. Talbot admits that this appears to be exceeding the powers of the municipality, which cannot lawfully prevent any contractor or person from carrying out an electrical installation, or refuse to supply such installation if the work is properly done. On the other hand, he approves of a system of registration for workmen, carried out not by any municipality, nor even by the I.M.E.A., but by the Electrical Contractors' Association, with the aid of an elementary examination.

Although at the Eastcroft destructor, Nottingham, over a million units were obtained from refuse last year, the President states that the handling and burning of the refuse alone costs more than the same output could be obtained for at the coal-fired generating station. Yet the destructor runs 14 to 18 hours a day, and generates 9 per cent. of the total electricity supplied to the city, with a load factor of 28 per cent. The explanation of the seeming paradox is that the destructor station supplies cheap units at the bottom of the day-load curve, leaving to the main station the expensive ones at the top of the peak, with a reduced load factor.

But refuse must be disposed of, and burning is the best method; it would be a pity not to utilise the heat generated, even though the electricity department has to contribute indirectly towards the cost of burning. It will be seen that, while Mr. Talbot recognises the advantage to the ratepayer derived from the generation of electricity from refuse, he is pardonably jealous of its effect upon the working costs of his undertaking.

We cordially welcome the President's remarks on the subject of reserve and depreciation funds; the former he considers a vital necessity, and he urges that it should be increased each year before anything is given to the relief of the rates, while the latter is also necessary to place the undertaking on a sound financial basis. The reserve fund in Nottingham stands at £43,926, and is invested outside the Corporation. The purchase of meters and other short-lived plant out of revenue, as recommended by the L.G.B. of late, does not appeal to Mr. Talbot so favourably.

Lastly, the President comments upon the variety of plant installed in some generating stations, and points to the admirable results obtained at the Nottingham works by adhering to one pattern throughout the 14 years they have been at work—only four armatures and one field coil have had to be repaired, and there has been but one short interruption to supply, and that during the daytime. For this policy Mr. Talbot expresses his indebtedness to his committee, whose chairman, Sir John Turney, has occupied that post for 16 years.

THE COUNCIL'S REPORT.

The report of the Council shows that the membership stands at 385, a reduction of seven as compared with last year; the total is made up of 175 Committees, 168 chiefs, two honorary members, 10 chief assistants and 40 assistants. During the year various matters have been discussed, including the report of the Departmental Committee on the accounts of local authorities, local authorities' liability under the Employers' Liability Act, the Home Office Regulations, the G.E.R. General Powers Bill, &c. The hon. treasurer's report shows a surplus of £39 for the year, and a total surplus of £349; the income for the year was £588, and the expenditure £549.

BUSINESS NOTES.

Santoni Flame Lamps.—THE SANTONI ARC LAMP AND ENGINEERING CO., LTD., of 11, Farringdon Avenue, London, E.C., write under date June 30th, as follows:—"We beg to inform you that we have instructed our solicitors to take immediate proceedings against Messrs. J. and H. Grevener, Eldon Street House, E.C., for their statement *re* our 'Santoni' flame lamps in their advertisement in last week's REVIEW."

Marseilles Electrical Exhibition.—In *L'Industrie Electrique* of June 25th there is given the programme of questions which will be put forward for discussion at the International Congress, which will sit at Marseilles from September 14th to 20th this year. The applications of electricity will form the principal subject for discussion on this occasion, though regulations and measures will receive attention. Reports on a wide range of practical questions have already been taken in hand by various engineers of repute, and these will be available to those who wish to take part in the discussions, on application to the Secretary, 63, Boulevard Haussmann, Paris. From a plan of the Exposition published by our valued contemporary, we infer that, apart from stands allotted to Bergmann and the A.E.G., the exhibits are almost wholly of French or Swiss origin. Not a single British name appears.

Battery Prices in Germany.—It was mentioned in these columns a short time ago that certain makers of stationary accumulators in Germany had lowered prices as a consequence of the fall in the quotation for lead. The most important company, and that which controls a large portion of the trade by reason of its absorption of other undertakings and by its intimate relations with the large manufacturing firms—the Berlin-Hagen Accumulator Works Co.—refrained from making a similar concession at the time. Now, however, it is announced that the company has abolished the 10 per cent. increase on the list prices of accumulators, which was introduced when lead so largely advanced. This percentage rise is stated not to have wholly covered the higher cost of production when lead was very expensive, the metal representing about 60 per cent. of the total value of the accumulators.

Book Notices.—*Electric Bells and all about Them.* By S. R. Bottone. London: Whittaker & Co. Seventh Edition. Price 2s. net.—In this book the author commences with the derivation of the word electricity and the observations of Thales, 2,500 years ago; he proceeds to describe the frictional method of producing electricity, but remarking on page 7 that this has not any practical application to bell-ringing, he turns to primary cells, and prepares a pitfall for learners by stating that the portion of an electrode *outside* the electrolyte is in a different electrical condition to the portion that is *in* the latter. A number of experiments are described relating to electrodes in dilute acid, and it is not until we arrive at page 31 that we come to the familiar Leclanché cell, entitled under fig. 8 a "Bell." Other cells, mostly useless for bellwork, are discussed, and, generally speaking, we find the author's treatment discursive and irrelevant. If he would keep to the business in hand, he would get on all right, but directly he leaves the beaten track of practice, he gets into trouble through loose wording and actual error. For instance, on p. 55, we have 1 square millimetre translated as $\frac{1}{25}$th of an inch; on p. 56, cells coupled in parallel "have their resistances reduced." The making of an electric bell is described in the words of Mr. G. Edwinson, as a good way for the bell-fitter to learn the peculiarities of electric bells, and probable faults are explained; the author then proceeds to describe various commercial patterns of bells, pushes, alarms, indicators, &c. He winds up with a few pages on the supply of the bell current from the lighting mains, showing in one case a resistance coupled direct across the D.C. lighting mains, and the bell circuit connected across a small portion of it (a horrible arrangement, which the author rightly condemns), and in another a transformer in a like position on an A.C. supply—a system little less objectionable. Unfortunately, the author states that with a primary coil of 100 turns and a pressure of 200 volts, a secondary of two turns would give 50 volts—a startling result, even from such a remarkable design. His remark on page 102 that the force exerted between two magnetic poles is inversely proportionate to the square of the distance between them, a "law" which he applies with conviction to the magnetic circuit of a bell, shows once more the danger of knowing a little.

The Engineering Index Annual for 1907. London: The *Engineering Magazine.* Price 10s.—This is the sixth volume of the Index, making a total period of 24 years for which continuous references are provided. As the Index is now issued annually instead of quinquennially, its usefulness is vastly increased, and the monthly continuation published in the *Engineering Magazine* brings it close up to date. Some 250 publications, in six languages, are examined; it is significant of the trend of progress to observe that three-fourths of the journals in question are printed in English. We have so often informed our readers of the excellence of this publication, that we hesitate to repeat our eulogy. Suffice it to say that the *Engineering Index* is the first work that one would naturally turn to, in order to carry out any search involving the examination of articles published in the engineering Press.

Physikalische Wandtafeln. By Prof. L. Pfaundler. First series: 12 tables. Brunswick: Friedr. Vieweg & Sohn. 1908. Price 12 M. (Single tables 1.50 M.).—This is the first instalment of a series of large wall diagrams, illustrating the properties of

gases, including steam, by curves; other diagrams show the construction of classical apparatus, such as Regnault's apparatus for determining the latent heat of steam, and the Hampson and Linde methods of liquefying air; others again give the melting and boiling points of various substances in tabular form. The present series is issued as an experiment, upon the result of which it will depend whether further diagrams are published or not. For lecture purposes, no doubt, such diagrams will prove extremely useful, though nowadays practically the same end can be attained by optical projection. The diagrams, however, have the great advantage that they can be left on view for any length of time, and several can be exhibited simultaneously, while they can also be put up before the lecture, and thus the services of an assistant during the lecture may be dispensed with. The sheets are of such dimensions that they can be read from any part of an ordinary lecture theatre, and for the most part they are as applicable to English classes as to German, the language of scientific measurement being universal; in some cases the titles are given in three languages. There are some objections, of course, to cut-and-dried diagrams and drawings; the gradual growth of diagrams upon the blackboard before the eyes of the students not only enables the latter to sketch them without difficulty, but also goes far—in capable hands—to explain the function and importance of the various parts; but the use of these printed diagrams does not preclude the teacher from using a blackboard also, and we have no doubt that in many places they will be found very helpful.

Les Nouveaux Livres Scientifiques et Industriels. Vol. I (parts 1 to 20). Paris: H. Dunod and E. Pinat. 1908.—This work consists of a bibliography of the works in the classes named, published in France during the period 1902-1907; it is divided into three parts: Subject index; author index; and the original quarterly parts as first issued. The last section, which constitutes the great bulk of the volume, gives the title, size, price and contents in brief of each work. We should not like to read this book conscientiously from cover to cover, as all good reviewers are believed to do; but it is well bound, and will form a comprehensive and useful reference book, of which we have no parallel in this country.

"Industrial Measuring Instruments." By K. Edgcumbe. London: A. Constable & Co. 1908. Price 8s. net.

"Field Telephones for Army Use." By Lieut. E. J. Stevens. London: Crosby Lockwood & Son. 1908. Price 2s. net.

"Science Abstracts." June 25th, No. 126, Sections A and B. London: E. & F. N. Spon, Ltd. 1908. Price 1s. 6d. per section.

Wolverhampton.—The District Electric Co., of Wolverhampton, have recently carried out an installation of electric lighting, telephones and bells, at the Nurses' Home in connection with the Wolverhampton and Staffordshire General Hospital, which has now been officially opened.

Paper Works Electrification.—We learn that the Brasted Paper Mills at Sevenoaks are being electrified to the specifications of Mr. Frank Broadbent, M.I.E.E., consulting engineer to the Brasted Paper Mills Co. All the motors are being designed for wide-speed ranges by means of shunt control, and in the case of the large machines, such as calenders, a speed control system is being used by means of which creeping speeds down to about 10 per cent. of the full speed can be obtained for leading in the paper. It is important that these low speeds should be maintained fairly constant while the paper is being threaded through the machine, and this will be possible by means of the system adopted, which is on the lines of rotary printing press control.

Trade Announcements.—Messrs. Pooley & Austin, of 25, Victoria Street, S.W., have been appointed sole agents in London and the Home Counties for Messrs. Engineering Instruments, Ltd., manufacturers of special totally enclosed motor control gear for direct and alternating current.

Messrs. Wm. McGeoch & Co., Ltd., have removed from 11, Charing Cross Road, to 90, Charing Cross Road, London, W.C., where they will have more extensive office and display accommodation.

Messrs. Crompton & Co., Ltd., have removed their offices in Salisbury House, London Wall, to a larger and more convenient suite on the first floor of the same building. The entrance will be in the main corridor, which is accessible from either London Wall or Finsbury Circus. Their telephone numbers will not be altered.

Messrs. R. Harman & Co. have removed their offices from 30, Gray's Inn Road, W.C., and their works from Stoke Newington, to larger and more convenient premises at Astbury Engineering Works, Astbury Road, Peckham, S.E., where the offices and works will be combined, and where the firm are manufacturing lifts, hoists, &c., as hitherto.

We learn that Messrs. Arc Lamps, Ltd., have now removed their works from Camden Town to their specially built factory at St. Albans. In order to facilitate the securing of spares, Messrs. Frampton & Paine, of 29, Old Queen Street, Westminster, their sole selling agents for London and the South of England, hold a stock of carbons, globes, and other spare parts.

The address of the Engineers' Club of Philadelphia has been altered to 1,317, Spruce Street, Philadelphia, Pa.

Bankruptcy Proceedings.—T. C. Hodgkinson.—An application was made on Thursday, June 25th, to Mr. Registrar Hope at the London Bankruptcy Court for an order of discharge on behalf of Thomas Clement Hodgkinson, trading as "The Electro Neurotone" at Goldhawk Road, Shepherd's Bush. The only offence reported by the Official Receiver was the insufficiency of assets to pay 10s. in the £ to the unsecured creditors. His Honour offered the bankrupt a discharge, subject to a judgment for £20, and after some discussion the hearing was adjourned until August 4th next.

Thomas Arthur Evans (T. Arthur Evans & Co., 14, Heathfield Street, Swansea), electrical and mechanical engineer and contractor. A receiving order was made on June 23rd on debtor's own petition. First meeting July 9th; public examination July 31st—both at Swansea.

Ernest Goacher, Gateford Road, Worksop, Nottingham, electrical engineer, &c.—The public examination of this debtor was to have been held last week at the County Court Hall, Bank Street, Sheffield, before Mr. Registrar Binney, but the Official Receiver informed the Court that the debtor went away about May 28th, and had not since been heard of. The examination was accordingly adjourned *sine die*.

F. B. Egginton.—The accounts under this failure mentioned last week show gross liabilities amounting to £103, unsecured liabilities £99, assets £17, and a deficiency of £82. Debtor attributes his failure to bad trade and pressure by creditors. He commenced business in October, 1905, and during the last six months has been repeatedly sued by creditors.

Dissolutions and Liquidations.—British Rubber Syndicate, Ltd., and British Copper Syndicate, Ltd.—These companies are winding up voluntarily, with Mr. H. Read Smith, 16, St. Helen's Place, E.C., as liquidator.

Chelmsford Electric Lighting Co., Ltd.—A meeting is to be held at Salisbury House, E.C., on July 30th, to hear an account of the liquidation proceedings.

Totnes Electricity Supply Co., Ltd.—A similar meeting of this company is to be held at the same address on the same day.

"Z" Electric Lamp Syndicate.—At a meeting to be held at Orient House, New Broad Street, E.C., on July 28th, Mr. H. J. Owens, the liquidator, will give an account of the winding up.

The Haste Pump Co., Ltd.—This company is winding up, with Mr. H. B. Clark, of 62, Old Broad Street, E.C., as liquidator. Creditors must send in particulars of debts, &c., by July 31st.

Sanfil, Ltd.—This company is winding up voluntarily, with Mr. F. S. Tomkins, Watergate House, Adelphi, as liquidator.

Roumanian Lamp Imports.—In an official report from Braila, the following statement is made regarding trade there in 1907:—Since the introduction of the electric light not long ago, the imports of "luxury goods," such as hanging lamps, table lamps, chandeliers and globes, show a decrease of not less than 30-40 per cent., and lamps for offices, for instance, are scarcely asked for at all. For cheaper goods such as table, wall, and kitchen lamps, the consumption may be said to be about the same as before, and the statistical figures of the value of the imported goods, which come chiefly from Bohemia, show no change. About 80 per cent. of the better quality lamps are imported from Austria, while the rest come chiefly from Germany—especially the table lamps which hail from Berlin. Austria-Hungary, Germany and France supply nearly the whole market with electric lamps. The value of the Austro-Hungarian imports of fine chandeliers is estimated at £1,200, and the import from France shows a similar amount. Crystal chandeliers come chiefly from Bohemia. Of incandescent lamps and small electric lamps and globes, the greater portion come from Germany. Some 10,000 incandescent lamps were, however, imported from Austro-Hungaria, chiefly from Hungaria. Of Nernst lamps, as well as Osmium lamps, the entire import is covered by Austria-Hungaria, while Germany predominates in all other electrical accessories, such as insulators, electric wires, &c. The report does not mention British goods, but agents and representatives with knowledge of the trade and well introduced, should find a good market.

Catalogues and Lists.—The International Time Recording Co., of 151, City Road, London, inform us that they have just brought out a booklet showing the fallacy of some of the methods at present in use of distributing the overhead or non-productive charges, and at the same time giving a system which will always, under all circumstances, accurately and properly distribute the overhead burden.

The British Electric Transformer Co., Ltd., Hayes, Middlesex.—Illustrated four-page circular briefly describing their Berry patent auto-transformers for use with metallic-filament lamps.

The Blackman Export Co., Ltd., 70, Finsbury Pavement, London, E.C.—Illustrated leaflets describing the double Blackman ventilating fan and their electrically-driven blowers.

A.E.G. Foreign Department.—A number of new sections to their catalogues, dealing, in English, with standard switch panels, lightning arresters, spare parts for flame arc lamps, high-tension oil switches, high-tension fuses, current collectors and accessories for crane motors, furnace hoists, &c., press-button switches, and c.c. ampere-hour meters. Full descriptive information, weights, dimensional drawings, and price particulars, are given in each case.

The Brockie-Pell Arc Lamp Co., Wimbledon, S.W.—Price list "T," fully particularising their patent high-efficiency auto-transformers for ordinary purposes, for use with metallic-filament lamps, and for arc lamp work. This department is an addition to the Brockie-Pell arc lamp business.

Messrs. L. E. Wilson & Co., 20, Cross Street, Manchester.—Four-page catalogue describing their Thomson pocket lamp, the Thomson electric gas lighter, and a belt lamp for policemen.

The C. W. Hunt Co., New York.—Pocket pamphlet, No. 081, containing a great deal of illustrated information relating to their coal-handling machinery, conveyors, industrial railways, &c.

THE ELECTRICAL CO., LTD., 121-125, Charing Cross Road, W.C. —New publications as follows:—No. 283, new automatic self-focussing "Projector" lamp; No. 285, Aegma miniature lamps with metal filaments for use with accumulators; No. 286, ozone ventilator; No. 287, portable testing instruments. In each a list of prices is given.

MESSRS. ALFRED HERBERT, LTD., Coventry.—Section "J" (ninth edition) of their catalogue giving a very full description of their patent hexagon turret lathes and their various parts. The 1908 pattern of these machines is shown. Its principal improvement lies in the great increase in the amount of belt power delivered to the machine to take advantage of the possibilities of the firm's patent roller steady tool. We undertand that in recent tests it has reduced 2 in. diameter bar mild steel to $\frac{3}{4}$ in. diameter at one cut, with a feed of 11 in. per minute, which means the removal of 7$\frac{3}{4}$ lb. of metal in one minute.

THE BRITISH ALUMINIUM CO., LTD., 109, Queen Victoria Street, London, E.C.—Two new publications in acceptable pamphlet form; one, discussing the question of "Aluminium *v.* Copper for Electrical Conductors"; the other, entering more fully into the whole subject of "Aluminium: Its Present and Future Uses."

MESSRS. ALFRED GRAHAM & Co., St. Andrew's Works, Crofton Park Road, S.E.—This is an admirably produced catalogue of between 80 and 90 pages, in which a variety of loud-speaking telephonic apparatus is set out, important improvements recently effected having been embodied. The company have specialised in the application of telephony in battleship and mercantile marine service, fortification and military works, and in docks, railway depôts, mines, power stations, &c., and in this book will be found representative examples of the types of instruments evolved in the course of their experience in these directions. We need not select any one or more of the items for special reference, but commend the catalogue to the notice of engineers and others who are specially interested in these matters. Some pages are devoted to lists of Governments, shipping companies, and vessels, for whom and for which the Graham loud-speaking apparatus has been supplied. There follows an illustrated account of the various departments at the works at Crofton Park.

THE WORTHINGTON PUMP CO., LTD., 153, Queen Victoria Street, London, E.C.—New catalogue (No. 8) in which in some 48 pages they give descriptions, with excellent and large photographic views, of the Worthington patent rectangular and circular steel cooling towers. Some of the pictures show the interior and exterior of the towers at Continental electric light, power, and tramway stations, illustrating very clearly the arrangements of air ducts, the water distributing system, the galvanised sheet filling, &c. Any reader can have a copy of this catalogue on application to the company.

MESSRS. RICHARD WADE, SONS & Co., LTD., Hull.—Revised copy of their catalogue of wooden poles containing the results of their tests tabulated for all purposes. This edition has been considerably enlarged, and should be of value to all engineers who are interested in overhead construction. We are asked to state that Messrs. Wade are sending the catalogue free of charge to regular customers only; the price to others is 10s. 6d. per copy.

THE HART ACCUMULATOR CO., LTD., Stratford, London, E.—Four-page circular, giving particulars, prices, dimensions, &c., of their special batteries for 25-volt high-efficiency metallic-filament lamps.

THE UNDERFEED STOKER CO., LTD., Coventry House, South Place, Finsbury, E.C.—New 40-pp. catalogue containing full and very finely illustrated descriptions of their mechanical "Underfeed" stoker. The theory and principle of the stoker are first expounded, notes on the different types and their applications following with clearly produced sectional and interior views. Some pages toward the end are filled with results of tests of boilers using hand-firing compared with those of boilers using the different "underfeed" types of stokers. The catalogue will be useful in the hands of engineers interested in stoking practice. We have received a list of orders recently received by the company for these stokers. A number of municipal Corporations are included therein—Birmingham, Newport, Colchester, Croydon, Leyton and Devonport, and we also observe that four "E" stokers have been ordered for Hornsby boilers by the Charing Cross, West-End and City Electricity Supply Co., Ltd.

MESSRS. A. GALLENKAMP & Co., LTD., 19 and 21, Sun Street, Finsbury Square, E.C.—Two catalogues; No. 47 gives particulars of the Meker hot-flame burners, Dennstedt's combustion furnaces, and compressed air in cylinders, while No. 48 deals with the Darling's calorimeter for solid, liquid and gaseous fuels, Hempel's gas testing lamp for fire-damp, and Haldane's apparatus for the analysis of air and mine gases. Both lists contain a number of drawings and views, also particulars of prices.

Germany.—A company has just been formed in Berlin to be known as the Berliner Elektromobilfabrik Gesellschaft, to manufacture and operate electric motor vehicles in the German capital.

Oerlikon Turbo-Generators.—The two 1,600-KW. three-phase turbo-generators which the OERLIKON CO. supplied to the Stockholm Electricity Works having given all-round satisfaction, the same Electricity Works have now placed with the company a repeat order for two considerably larger turbo-generators, *i.e.*, each for 6,000 KW. output. The turbines will be built for a steam pressure of 13 kg. per cm². abs., and a vacuum equal to 0·05 kg. abs. The steam will be superheated to from 280-300° C. The generators will work at 6,000-6,500 volts, at 25 cycles per second, with a power factor of 0·85, and will run at 750 R.P.M. Not long ago the Kensington and Notting Hill Electric Lighting Companies placed an order with the company for two 1,600-2,000-KW. three-phase turbo-generators; and all the inductor type generating plant at Wood Lane was built by the Oerlikon Works.

Electric Steel.—Recently a number of representatives of steel works in various countries visited the works of the Rochling Iron and Steel Co., at Volklingen, to inspect a new type of electric furnace. The latter is a modification of the Kjellin type, designed for a charge of three tons, which has been continuously at work for several weeks, and which purifies the liquid charge of the basic converter, eliminating all traces of sulphur and phosphorus. The manufacture of steel by electricity has been carried on for a year at these works.

Restoration of Lapsed Patent.—Notice is given in the *Illustrated Official Journal* (Patents) that ANDRE BLONDEL has made application for the restoration of the patent granted to him for an invention for "Improvements in or relating to wireless telephony," No. 15,527, July 11th, 1902, which expired on July 11th, 1906, owing to the non-payment of the prescribed renewal fee. Any person may give notice of opposition to the restoration on or before August 24th, 1908.

LIGHTING and POWER NOTES.

Birkenhead.—The E.L. undertaking for the year ended March 31st shows a gross profit of £10,488, and after payment of interest, sinking fund, and income-tax, there is a surplus of £2,584. Out of that, £1,000 goes to the relief of the rates, and £1,584 to the renewals fund, together with interest on investments, &c., raising it to £11,118. The debt on this undertaking was £115,347.

Braunton.—This village, between Ilfracombe and Barnstaple, is considering the advisability of lighting the township with electricity. At a meeting of the P.C. it was resolved to ask the R.D.C. to withdraw permission given to a gas company to break up the road.

Brierfield.—On June 25th Mr. W. A. Ducat held a L.G.B. inquiry relative to the Council's application to borrow £4,000 for improvements. It was mentioned by the clerk that among the outstanding loans was £14,872 for tramway and electricity purposes. There was no opposition.

Cardiff.—Mr. J. Allcock, the city treasurer, in his report on the working of the tramway and electric light departments during the past year, says that the tramway receipts were £109,979, as compared with £106,550 for the previous year, the expenditure being £69,354, as against £71,261. The amount to be set aside for depreciation is £14,522. Dealing with the accounts of the electric lighting undertaking, Mr. Allcock states that the income during the year was £39,210, compared with £35,576 in the previous year, and the expenditure £24,645, as against £25,930. The gross profit carried to net revenue account was £14,556, compared with £9,646, an increase of £4,910. The deficiency of £2,426 which existed on the net revenue account on March 31st, 1907, has been added to during the year by £911, the revenue deficiency at March 31st, 1908, being £3,338. Having regard to the deficiency, Mr. Allcock states that it is impossible to meet the requirements of the depreciation fund as approved by the City Council.

Continental Notes.—RUSSIA.—A large electric power plant has recently been installed at the Alexandre Works of the Société de Briansk, in South Russia. The plant, which is utilised to drive 11 iron rolling mills, comprises one 3,500-H.P. and two 1,750-H.P. steam turbines and dynamos.

Coventry.—Mr. F. H. Tulloch held a L.G.B. inquiry on Friday, concerning the City Council's application to borrow £35,000 for electric lighting purposes. The town clerk said that £10,000 of the money was required in respect of the extension of the distributing plant in the old area which existed before the Corporation Act of 1907. Under that Act they acquired power to supply electricity to additional parishes outside Coventry. The £10,000 was made up as follows: £5,000 for mains; £1,500 for transformers; £500 for meters; £1,000 for services; and £2,000 for motors. This application was occasioned by the expansion of the city. £25,000 was required in consequence of the compulsory laying of mains in certain parts of the added area to which he had referred, required by the Board of Trade. It was not intended to spend the whole of £25,000 at once. The engineer's intention was to lay the pipes and cables to the boundary of the old area and to continue the pipes into the new area in the parishes of Foleshill and St. Michael's Without. It was only intended to lay cables in them where a demand was made for energy.

The Corporation has issued reports by Mr. J. A. Jeckell (manager and engineer of the electricity works) and Mr. E. T. Peirson (the city professional auditor) with respect to the depreciation and obsolescence of the plant. Many of the loans, says the manager, will be extinguished in twenty years, and some of the plant has already become obsolete and been superseded, "but this was because the plant was obsolete at the time it was installed, and there seems to be no likelihood of any vast improvement being made in the generating plant as we now have it, except by some

invention which would, to a great extent, revolutionise the whole machinery throughout the world." The auditor's financial conclusion on the manager's report and schedules is that the sinking fund is adequate to meet the requirements in respect of wasting assets; but he thinks £15,000 should be set aside in the next six years to provide for renewals required before the expiration of the loan periods, as well as for the risk of obsolescence or serious breakdown. By this course there will be, in 1934, a substantial value remaining to the credit of the electricity department.

Croydon.—The B.C. Committee reported on Monday that the fitting of three large boilers with mechanical stokers had resulted in a considerable saving. Two additional boilers are now to be so fitted at a cost of £620, and tenders are to be invited.

Denny.—With reference to the note that appeared in our issue of June 19th, it should be stated that Messrs. Stevenson and McGuffie, of Glasgow, are acting as consulting engineers for the Denny and Dunipace Town Council, also that they are drawing up a new specification at present for street lighting, and distribution of light and power to consumers. This specification they hope to issue in the course of a week or two.

Epsom.—The L.G.B. has had under consideration an application from the U.D.C. for sanction to borrow £11,600 for E.L. purposes, and has sanctioned the borrowing of £10,120. The L.G.B. has deducted from the amount of the application (1) engineer's house, £684; (2) hand tools, £37; (3) stationery, £61; (4) over-charge on house service, £92; (5) over-charge on meters, £468; total of deductions, £1,342, also engineer's fees on these amounts, £33. With reference to the engineer's house, the L.G.B. did not see that this item could be regarded as necessary expenditure, while as to the hand tools and stationery, it did not deem these items as proper subjects for a loan. The Board was advised that the average prices charged for house services and meters were too high, and the sums deducted represented the total amounts of the charges in excess of prices which had been accepted by Messrs. Edmondsons as fair and reasonable in other cases. The whole matter was considered at a meeting of the Council held last week, when, in reply to a question, the clerk of the Council said that the deductions meant that Messrs. Edmondsons had to pay for those items and not the Council. The sanction of the loan of £10,120 was for a period of 16 years, and, as this was not long enough to fit in with the arrangements made between the Council and Messrs. Edmondsons, the clerk suggested that the Council should apply to the L.G.B. for sanction to the same term as for the previous loan, viz., 25 years. The clerk's suggestion was agreed to.

Heywood.—The T.C. is going to apply to the L.G.B. for powers to borrow £16,009 for electricity supply works, and £4,015 for tramway purposes.

Ilford.—Commenting upon the accountant's abstract of accounts relating to the electricity undertaking at a meeting of the U.D.C., Councillor Philpot drew attention to the fact that the reserve fund now stood at £6,483. During the year £5,577 additional capital had been spent, making a total of £157,271. The business was still increasing, and the year's gross profit was £9,670. However, interest and instalments of principal, interest on mortgage debt, and a repayment of £557 to the tramway department on account of machinery used for the generation of electricity, had required an expenditure of £10,045, so that there was a deficit of £3/5. The price of coal advanced during the year, and the undertaking had to pay more; and for 12 months the charge of 3½d. per unit to the ordinary consumer, instead of 4d., had been in force. The price for public lighting had been reduced. For the coming year they had made their coal contracts at a considerably reduced price. The Ilford Education Committee has requested the electrical engineer to prepare an estimate for the installation of electric light at Cleveland Road Schools.

India.—According to an exchange, the Government of Bombay has sanctioned an estimate amounting to about R. 20,500 for installing electric lights and motors in the Yeravda gaol.

Leicester.—The T.C. has adopted the following new tariff for energy for motive power:—15s. per quarter for every H.P. in respect of the maximum H.P. demanded, and ¾d. per unit; consumers to be allowed to use current up to 20 per cent. of the consumption for lighting.

Littleborough.—Subject to satisfactory details of agreement being arranged, the Rochdale T.C. has decided to supply electricity in bulk to the Littleborough U.D.C. The price for alternating current, three-phase at 3,000 volts, is to be 3d. per unit for the first 100 hours per quarter, and 1d. per unit afterwards.

London.—Marylebone.—A statutory declaration has been received from the secretary of the Reason Manufacturing Co., Ltd., stating that the amount of the profit accruing to Mr. A. Wright from transactions between the Council and the company up to March 31st last was £36 2s. This sum, according to arrangement, is to be deducted from Mr. Wright's account. Tenders are to be invited for the re-arrangement of Aybrook Street sub-station buildings for the purpose of properly concentrating the electrical distributing staff under healthier conditions. The L.C.C. is to be asked for a loan of £5,000 to carry out the work.

Stepney.—The B.C. E.L. Committee has resolved that legal proceedings be commenced against the City of London Electric Lighting Co., Ltd., for restraining the company from continuing the supply of electrical energy for consumption within the Tower of London, which, it is contended, is outside the company's statutory area of supply, and within the area of the Borough Council. The Committee report that the officials of H.M. Office of Works gave the company permission to lay and maintain cables within the Tower precincts, but that no formal licence was granted by them, as it was not considered to be necessary.

The B.C. is to apply for a loan of £2,520 for the purchase of additional meters.

Southwark.—The Council has resolved to install an induced draught plant to the boilers, at an estimated cost of £475, the fan and motor to be supplied by the Electric Construction Co. (cost £330).

Fulham.—The accounts of the electricity undertaking for the year ended March 31st have closed with a surplus of £1,408, of which £1,000 is to be transferred to machinery maintenance and reserve accounts, and the balance is to be retained on revenue account. The gross expenditure for the year shows a reduction on the estimates, and the estimated receipts have been exceeded by £270. The total expenditure on public lighting is less than the estimates by £460, notwithstanding a large amount of extra work carried out.

Lambeth.—The South Metropolitan Gas Co. has been carrying out experiments with respect to the street lighting around the new Town Hall on Brixton Hill, and has asked the B.C. to defer a decision for 12 months as to the form of lighting which shall be finally adopted. Meanwhile the company will light and maintain the lamps and supply gas free of charge. The Council accepted the offer.

Wandsworth.—The County of London Electric Supply Co. has informed the B.C. that the failure of the electric supply which took place on May 29th, was due to a portion of the company's circuit being interfered with by lightning.

Malton.—The U.D.C. has accepted the tender of the Northern Counties Electricity Supply Co., Ltd., at £400 per annum, for public lighting.

Manchester.—At an L.G.B. inquiry into the City Council's application to borrow £130,500 on electricity account (to meet the cost of extensions), it was stated to be the Committee's intention largely to increase the generating plant at the Stuart Street high-tension station. Figures showing the growth of the undertaking were given by the assistant town clerk. The scheme in respect of which the application was made will provide new plant with a capacity of 12,000 KW. It is intended to carry out half the scheme in the winter of 1908-9, and the other half in 1909-10. The first instalment will involve an expenditure of £53,750, and the second one of £54,750. The application was supported by the Property Owners' Association and the Retail Traders' Association of Manchester. The inspector said the L.G.B. might sanction the loan for the first instalment, and wait until provisional tenders had been obtained before sanctioning the remainder. Another inquiry would not be necessary.

The report of the Electricity Committee for the year ending March 31st has just been issued. The total income of the department was £384,602, as against £346,545 in the previous year, and the working expenses (including the provision in both years of £40,000 for future renewals) was £219,358, as against £184,801, leaving the gross profit £165,244 as compared with £161,744 in 1906-7. After deducting interest and other charges, a net surplus remains of £19,543, of which £1,998 has been appropriated for extension of works (for which borrowing powers cannot be obtained), and £10,000 has been paid to the city fund, in aid of rates, the balance £7,545 being carried to reserve. The total output from the three generating stations during the past year amounted to 82,752,989 units, as compared with 63,056,914 units in the previous year—an increase of 31·24 per cent. The quantity measured and accounted for during the same time was 67,316,771 units, showing a difference of 15,436,218 units, or 18·65 per cent., being the quantity used in distribution, or otherwise not accounted for. The corresponding percentage in the previous year was 18·55. The total mileage of main conductors laid at March 31st, 1908, equalled 338 miles 1,084 yards, being 16 miles 1,001 yards more than at March 31st, 1907.

Oldham.—The electricity works accounts show a gross revenue of £40,016 and an expenditure of £20,426, leaving £19,590 as gross profit for the year. Interest and sinking funds required £17,866, leaving a net surplus of £1,724. During the year £3,352 was expended on capital account, making it £284,431; 1,382,648 units were sold, exclusive of traction, producing £15,121, an increase of 22·58 per cent. in units and 8·77 per cent. in money; 3,888,404 units were sold for traction, producing £24,303 (increase 12·61 per cent.). The lamps connected increased by 25·11 per cent. to 117,182, and the consumers by 74 to 932.

Orders Revoked.—The Hemsworth and District 1905 E.L. Order has been revoked; also the following:—The Sandwich, Deal, Walmer and District Order of 1903, the Sittingbourne and Milton Order of 1903, and the Stroud, Nailsworth and Dursley Order of 1904.

Pontypridd.—On June 18th the new electrical winding engine at the Maritime Pit of the Great Western Colliery, Pontypridd, was tested on load under the supervision of the consulting engineer, Mr. G. H. J. Hooghwinkel, M.I.E.E., of Westminster. We are informed that the results were entirely satisfactory, and that this is practically the first large electric winding engine erected in this country.

St. Austell.—The U.D.C. has accepted the tender of the electric lighting company for public lighting.

Sheffield.—The accounts of the electricity department show that £33,295 was spent on capital account during the year. The income from all sources was £78,544, and working expenses were £25,344, leaving £53,190. Interest and other financial charges were £27,139, and loan redemption proportion absorbed £21,255. There was thus a net surplus of £4,796. The number of units sold shows continued rapid increase. As regards light and heat the increase during the past year was less rapid than in the preceding year. The difference, though small, is, the report states, probably traceable to the introduction of metallic-filament lamps, the higher efficiency of which is likely, when they become more widely used, to result at first in a falling off in the amount of energy sold for lighting, or at least to make the net advance looked for each year less than it has been. There was a continuous and rapid advance in the energy sold for power. The number of consumers advanced from 3,207 to 3,383. This year, for the first time, the amount of energy sold for power, and the capacity of motors connected, exceed the respective values of light and heat. Mr. Fedden states that the increase in the consumption of energy for motive power is still rapid, and greater in proportion than the increase in the number of consumers. This, he states, is due to the introduction of electric driving in large works, which is continually in progress. "The use of electric power is becoming widely appreciated. Many new connections are traceable to the recommendations of consumers, and continuous canvassing and advertising are producing results eminently satisfactory to the department." In considering the year's financial results, Mr. Fedden points out that allowance must be made for the increased price paid for coal, amounting to £2,304 during the year, and equivalent to ·06d. per unit sold, from which it follows that the surplus of £4,796 would have been increased to £7,100 had fuel been purchasable at the average price obtaining in the year 1906-7.

South Stoneham.—The R.D.C. has been informed that it is the intention of Southampton T.C. to apply for a prov. order to supply electricity within the Council's district.

Stafford.—It is reported that the electricity accounts show a year of steady growth, especially in power demand. After paying interest and sinking-fund charges there is a net surplus of £20.

Walthamstow.—The excavations and the construction of the foundations for the new chimney shaft, boilers, &c., at the generating station are to be carried out by direct labour. The electrical engineer has been instructed to substitute Osram lamps for 32-c.p. lamps on lamp columns in such parts of the district as he thinks suitable.

TRAMWAY and RAILWAY NOTES.

Accrington.—The net surplus on the Corporation electric tramway undertaking for the year was £1,145. This includes a sum of £486, the Corporation's share of net profit on the old tramway system. There is set aside £562 to sinking fund, £300 is the cost of temporarily lighting the track during construction, and £291 is the cost of overtime. It has been decided to carry £1,145 forward to the current year. On the electricity undertaking the net profit for the year was £604.

Belfast.—A special meeting of the Corporation was held on Friday last for the purpose of considering a report from a deputation which had recently visited a number of English cities to make inquiries as to the stages and fares in operation on their tramway systems. The report virtually showed that the existing penny stages in Belfast are excessive, and that they should not under any circumstances exceed two miles. The report also advised the introduction of a halfpenny half-mile fare. After some discussion the report was adopted.

Birkenhead.—The Corporation tramway accounts for the year ended March, 1908, show a profit of £20,964. Interest and sinking-fund charges absorb £21,564, the deficit being made up by a contribution from the borough fund. The debt still to be redeemed amounts to £296,488.

Continental Notes.—SWEDEN.—It is reported that the experiments carried on by the Swedish Government have been so successful, that it has been decided to adopt electric traction on all the lines from Bollnas to the south coast, some 2,026 km. The Government has already acquired several waterfalls, and will transmit power at 50,000 volts to transforming stations, which will be spaced about 50 km. apart, and will reduce the pressure to 15,000 volts for the line. The expenditure on generating stations is estimated at £957,000, and on the distributing system at £1,290,000, making a total outlay, with other expenses, of £2,430,000. On the basis of the results obtained in 1905, the running costs, with electric traction, would amount to £238,500, showing a net economy over steam of £18,100. A saving of £163,700 would be effected for fuel, but this would, of course, be off-set by other expenses to some extent. Allowing for an increase of traffic of 60 per cent. by 1920, an economy of £140,000 is anticipated.

Croydon.—The tramway accounts for the year ended March 31st came before the Croydon B.C. on Monday evening. The report of Messrs. Cash, Stone & Co., professional auditors, showed that the balance of the net revenue account for the year (after payment of interest, income-tax, sinking-fund contribution and instalment of loan) was £2,830, which had been added to the renewals fund. This account, the auditors added, had been charged with £1,202 for overhead work renewals on the Purley-Norbury line. This made the net addition for the year £1,627, which, added to the balance on March 31st, 1907, left £15,418 in the renewals fund. "All ordinary repairs and renewals have been borne by revenue, but the above sum, which is all that is available out of the year's profits, is apparently not an adequate proportionate contribution for future anticipated renewals of the track and rolling stock." The manager (Mr. T. B. Goodyer) reported that with a total revenue of £27,595 derived from working the Thornton Heath route, there was a loss of £2,150 10s. On his advice, the Committee recommended that the working of the Whitehorse Road section (opened in November, 1906) should be discontinued "for the present." The reduced net balance in comparison with the previous one was returned as being due to (1) decrease in traffic receipts, £1,785; (2) loss on Thornton Heath route, £2,150 10s.; (3) increase in energy charges (due to meters being found faulty), £2,850; (4) increase in permanent-way charges, £2,460; and (5) increase in capital charges (about) £2,000. The reduced traffic receipts were ascribed to unfavourable weather. The manager pointed out also that if the average fare charged had been equivalent to the average paid on 57 other municipal systems, the traffic receipts would have benefited by £12,886. The Croydon average fare per mile is ·52d., and only in five instances is it cheaper, viz., Hull, ·36d.; Sheffield, ·40d.; Leicester, ·47d.; Liverpool, ·45d.; and Glasgow, ·44d. Alderman Trumble moved the report, admitting that it was disappointing, and "not as satisfactory in any way as we could wish," but he contended that there were several hopeful features, and urged that the provision for depreciation had been adequate. The report and accounts came in for severe criticism in the debate, and an amendment to refer back the proposal to cease running on the Whitehorse Road route was lost by 24 votes to 23. An attempt was then made, by another amendment, to get the Council to withhold this suspension till October 1st, for the sake of the summer traffic. This proposal was rejected by 25 votes to 22. In the end the report and accounts were adopted.

Dumbarton.—The line from Dalmuir to Balloch was opened last week.

India.—The tramway system of the Delhi Electric Tramways and Lighting Co., Ltd., was formally opened on the morning of June 3rd by the Deputy Commissioner, Mr. R. Humphreys, who drove the first car, under the guidance of Mr. J. G Griffin, the general manager. A large company subsequently sat down to a "sumptuous breakfast" in the car-shed. Mr. Griffin, in responding to a toast, said that there was still much to be done in the way of finishing touches. They had laid 10 miles of track and planted 700 poles. He made the following reference to the failure of the contractors:—The most unfortunate failure of Messrs. Bruce Peebles & Co. has been a serious matter for the Tramways Co., who had to become their own contractors at a moment's notice and complete a large portion of the work. The directors are aware that the failure of Bruce Peebles & Co. has been a very serious matter to several contractors and merchants in Delhi, and they sincerely sympathise with these creditors and greatly regret that such large sums were owing by Messrs. Bruce Peebles. Whilst we have had to take up a position which we know is objected to by these contractors (lawyers smile), the directors wish it to be known that apart from the terms of the contract, which entitle the company to take possession of everything, they had, at the time of the contractors' failure, paid Messrs Bruce Peebles more than the full value of all materials supplied. Further, we do not think that the action we have taken can in any way influence the just settlement of the creditors' claim by Messrs. Bruce Peebles & Co.'s liquidator.

In the evening the cars were running free of charge to the public. There are 24 cars, and the routes run to practically all the principal parts of the city, as well as to the outskirts of Subzee, Mandi and Sudder Bazar.

London.—L.C.C.—At the meeting on Tuesday the Council proceeded to consider an estimate of expenditure of £1,290,000 on capital account during 1908-9 for the purchase of tramway undertakings, reconstruction for electric traction and the construction of authorised new tramways and incidental works. The Finance Committee recommended that the estimate should be approved; to this an amendment was moved by Sir John Benn to add the words, "and that in view of the profitable results referred to in the memorandum of the chairman of the Highways Committee, and the pressing demand for more electric tramways in London, it be referred to the Committee to bring up a supplemental estimate providing for a capital expenditure equal to the average of the past two years." The amendment was seconded, and a lengthy discussion ensued, in the course of which it was stated that the Council's officials now estimated the cost of renewals at ¾d. per car-mile, instead of 1d. per mile as formerly.

The Council postponed for a week the consideration of a report by the Highways Committee asking for approval of an estimate of expenditure of £32,110 for the reconstruction on the conduit system of the existing horse tramways from East Hill, Wandsworth, *via* St. John's Hill to Falcon Road, and the extinction of the liability of the Council to maintain portions of the carriageways in Wandsworth Road beyond the tramway tracks and ordinary 18-in. margins.

The Aldgate to Bow Bridge line equipped on the "G.B." surface-contact system commenced running on June 25th.

Manchester.—The Royal Assent having been given to the provisional order obtained by the Corporation for its intended new tramway in Princes Road, Moor Side, the work will be begun without delay. It will connect with the new shed, which is to be built at the end of this road, for the accommodation of 250 cars.

Newport (Mon.).—The Corporation tramway accounts for last year show a gross profit of £11,558, and after paying off £6,067 principal and interest, and £2,858 to the sinking fund, there was a net profit on the tramways account of £2,632. Last year the net profit amounted to £2,243, and in 1906 to £1,772. The balance-sheet of the electric lighting account showed a net loss of £1,044, against a net gain of £97 in the previous year. It was pointed out that there were excellent prospects of making a profit on the electricity account this year, as the coal contracts entered into were considerably below those of last year.

New York.—On Saturday last 30 passengers were injured in a collision that occurred on the Third Avenue Elevated Railroad. A seven-coach train, carrying 1,000 passengers, overtook another and ran into it.

TELEGRAPH and TELEPHONE NOTES.

France.—The Paris correspondent of the *Daily Mail* reports that Postmaster-General Simyan has decided to try the Lorimer automatic telephone system at Lyons, with 200 subscribers.

Persia.—During the troubles in Persia, the staff of the Indo-European Telegraph Co. at Teheran were in a position of considerable danger, the station being under fire during the fighting; bullets flew around and over the station, and wounded one of the native staff in the compound.

Radio-Telegraphic Convention.—On Wednesday last the provisions of the Convention came into force. The Postmaster-General has given notice in the *London Gazette* that the Regulations made in pursuance of the Wireless Telegraphy Act, 1904, as to the working of apparatus for wireless telegraphy installed on foreign ships whilst in our territorial waters, can now be obtained from the usual official agents; and notices will shortly be issued as to the stations on our coasts which are available for communication with ships at sea, as well as the lists of ships and shore stations generally, and of the rates charged. Communication will be possible by means of the land telegraphs, from telegraph offices in the United Kingdom, by way of foreign wireless stations to ships in their vicinity, and *vice versâ*, without regard to the system of wireless telegraphy employed.

Telegraph Rates.—The French Postal Committee has adopted the proposal for the reduction of the postal rate for letters between France and England from 2½d. to 1d. and the telegraph rate from 2d. to 1d. per word.

Telegraphic Interruptions and Repairs:—

Cables.	Interrupted.	Repaired.
Curacao-Coro Curacao-La Guayra } Closed Curacao-Maracaibo	Jan. 12, 1906	
Tarifa-Tangier	Jan. 18, 1904	
Port Arthur-Chifu (Closed)	Mar. 9, 1904	
Las Palmas—Arrecife	May 18, 1908	
Cayenne-Salinas	May 9, 1908	
Pera-Dardanelles	May 20, 1908	
Sierra Leone-Accra	May 28, 1908	
Cadiz-Tangier	June 3, 1908	

Wireless Telegraphy.—Arrangements have been completed for wireless telegraphy at the station at Choshi in Shimosa Province, near Cape Inuboe, the most easterly point in Japan, and messages can be dispatched to vessels within 120 miles of the station. The charges are treble the ordinary land rates, or double if the telegram does not pass over the land wires. It is intended to establish public wireless stations later at Shiwomisaki in Kishu, Osezaki on the Goto Islands and on Tsunojima in Choshu. The steamers on which the apparatus has been installed are those of the Nippon Yusen Kaisha and Toyo Kisen Kaisha, which sail to America.—*Board of Trade Journal.*

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—MELBOURNE.—July 20th. Arc lamp globes for the City Council. See "Official Notices" to-day.

Belgium.—The municipal authorities of Amay and Ampoin (Liége province) lately invited tenders for the concession for the public and private electric lighting of these two little towns. Not a single offer was, however, received.

August 11th.—The municipal authorities of Louvain are inviting tenders for the concession for the supply of electrical energy for public and private lighting and power purposes in the town. Full particulars can be obtained from Le Directeur de l'Usine de Paz, while tenders are to be sent to Le Collège des Bourgmestre et Echevins de la Ville de Louvain.

Bethlehem (O.R.C.).—July 15th. The liquidator of Harris, Lee & Co., Ltd., is inviting tenders for the purchase as a going concern of the concession for the supply of electricity in Bethlehem, O.R.C, with engines, buildings, poles, wires, tools, &c. See "Official Notices" to-day.

Burnley.—The Tramway Committee is in the market for five new cars, the tops of which will be covered the full length of the roof and partially enclosed in the centre.

Corsica.—The municipal authorities of Bastia are open to receive proposals for the lighting of the town either by gas or electricity.

Dublin.—July 13th. Sub-station switchboards, transformers and accessories, for the Corporation. See "Official Notices" June 26th.

July 13th.—Boiler plant for the Pigeon House generating station for the Corporation. See "Official Notices" June 26th.

Felixstowe.—July 15th. Overhead lines and services for the U.D.C. See "Official Notices" to-day.

Germany.—The municipal authorities of Arnsberg, Westphalia, are about to invite tenders for the establishment of a central electric lighting station in the town, at an estimated cost of £25,000.

Gillingham.—July 17th. E.L. installation for schools for the Education Committee. See "Official Notices" to-day.

Hungary.—July 15th. The municipal authorities of Vajdahunyad are inviting tenders for the establishment of a central electric lighting station in the town.

Tenders are shortly to be invited by the municipal authorities of Zsombolya for the establishment of a central electric lighting station in the town.

Italy.—July 15th. The Italian State Railway authorities in Rome are inviting tenders for the supply of 1,100,000 metres of telegraph cable for use in tunnels.

Lancaster.—July 4th. Two complete installations of 100-KW. continuous-current dynamos, gas engines and producers, for the County Asylum, Lancaster.

London.—L.C.C.—July 7th. High-tension main switchgear and low-tension auxiliary switchgear, for the East Greenwich generating station of the L.C.C. See "Official Notices" June 19th.

July 21st.—Six electrically-propelled stores transport vehicles for the L.C.C. Tramways Department. See "Official Notices" to-day.

ISLINGTON.—July 16th. Cooling tower for the Lighting Committee. See "Official Notices" June 26th.

ST. PANCRAS.—July 13th. Low-tension switchboard additions at King's Road generating station, for the B.C. See "Official Notices" June 26th.

Ormskirk.—July 8th. Electric wiring of new imbecile pavilion and hospital extension, and E.L. fittings, for the B.G. The Master, Union Workhouse, Ormskirk.

Russia.—September 14th. The Town Clerk of Odessa (Upiawa) will receive tenders for a concession to erect and work a power and lighting supply. A central station of a minimum of 6,000 H.P. is to be erected and equipped.

CLOSED.

Australasia.—According to the *British Australasian*, the tender of Messrs. Siemens Bros., of London, for the manufacture and laying of two new cables between Victoria and Tasmania has been accepted by the Federal Government, the price being £47,955. The Postmaster-General has accepted the tender of the Western Electric Co., Sydney, for the supply and delivery of 20 miles of telephone cable at £490 per mile (a total of £9,800), and 150,000 paper sleeves.

Belgium.—Five concerns, including one British—Messrs. T. Bolton & Son, London—submitted tenders for the supply of 45 kilometres of trolley wire for the Société Nationale des Chemins

de Fer Vicinaux, of Brussels. The lowest offer was that of the Compagnie Française des Métaux, of Paris.

Fifteen firms, including one British—Callender's Cable and Construction Co., London—submitted tenders to the municipal authorities of Antwerp for the supply of 1,600 metres of electric cables, the lowest being that of the Land und See Kabelwerke Gesellschaft, of Nippes, Cologne.

Bolton.—The Electricity Committee on June 25th accepted the tender of the British Insulated and Helsby Cables, Ltd., for 12 months' supply of wire for the fittings department, and of the British Westinghouse Co. for the supply of a combination booster.

Croydon.—The tender of Messrs. Babcock & Wilcox, Ltd., was accepted by the B.C. on Monday for the supply of materials for alteration to feed-water mains (£143).

Dartford.—The U.D.C. has accepted the following tenders for annual supplies to the electricity department:—

Johnson & Phillips, Ltd.—House-service cable, jointing material and accessories, £159.

Beadle Bros., Ltd.—2,500 to 3,000 tons South Hetton rough small coal, 14s. 6d. per ton.

E. J. & W. Goldsmith, Ltd.—2,000 to 2,500 tons of coke breeze, 8s. 6d. per ton.

Halifax.—The Electricity Committee has accepted tenders for cable work as follows:—

British Insulated and Helsby Cables, Ltd., Prescot.—Lead-covered cables: Pellon Lane lighting feeder, £861; Gibbet Street distributor, £321; Skircoat Green Road distributor, £129.

Callender's Cable and Construction Co., Ltd.—Bitumen cable: Hanson Lane distributor, £123.

The following tenders for conduits have been accepted:—

Messrs. Oates & Green, Ltd., Halifax.—940 yards of six-way 2½ in. earthenware conduits, £258 10s.; and 1,880 yards of three-way 2½ in. earthenware conduits, £255.

High Wycombe.—The Borough Education Committee has accepted the tender of the Electric Lighting Co. for installing the electric light at Spring Gardens Schools, at £79 19s., with tantalum lamps, 99 lights and 51 switches. The lowest tender for gas was £95 10s.

London.—The tender of the E.M.F. Manufacturing Co. for the supply of tantalum lamps and fittings to the Metropolitan Asylums Board for the year ending June 26th, 1909, has been accepted.

L.C.C.—The Highways Committee of the L.C.C. proposes to extend a contract with E. C. & J. Keay, Ltd., for additional steelwork required for the second portion of the Greenwich station.

Plymouth.—The Corporation Electrical Committee has accepted the tender of Messrs. Cory Bros., Cardiff, for 7,500 tons of coal at 13s. 1½d. The price for the last contract, 1,000 tons, was 14s. 1½d.

Rawtenstall.—The T.C. has placed an order with Messrs. E. Bennis & Co., Ltd., for six stokers and self-cleaning compressed-air furnaces for Lancashire boilers, in connection with its electricity undertaking.

Wimbledon.—The E.L. Committee has decided to accept the following tenders:—

Charrington, Sells, Dale & Co.—Supply of coal for electricity works for year ending June 30th, 1909: "Mapperley small nuts," 15s. 9d. per ton.

Edward J. Shaw & Co.—Arc lamp globes for year ending March 31st, 1909.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERBARGOED.—Cottage Hospital for the Powell Duffryn Steam Coal Co., Ltd. G. Kenshole, architect, Bargoed.

ABERCYNON (PONTYPRIDD).—Mixed School at Carnetown, for the Mountain Ash Education Committee. W. H. Williams, architect, Town Hall, Mountain Ash.

ABERDARE.—Additions to Vicarage. J. W. Rodger, architect, 14, High Street, Cardiff.

ABERDEEN.—Reconstruction of walls of Trinity Congregational Church, Shiprow (£500). The Minister, Trinity Congregational Church, Aberdeen.

Alterations and additions to the Royal Asylum (including electric lighting installation). Kelly & Nicol, architects, 367, Union Street, Aberdeen.

Fish-curing premises in Poynernook Road, for Allan & Dey.

Proposed dock extension scheme (£220,000). Mr. Nicol, Harbour engineer, Aberdeen.

ABERDEENSHIRE.—Additions to Rora Public School and Kinmundy School. Arthur Clyne, architect, 123½, Union Street, Aberdeen.

ABERTILLERY.—New Presbytery for Rev. Father O'Donoghue. G. Telford Evans, architect, 8, Queen Street, Cardiff.

ABOYNE.—Alterations on Boghead farm on Aboyne Castle Estate. Davidson and Garden, 12, Dee Street, Aberdeen.

ACCRINGTON.—Prospective rebuilding of the Hippodrome (recently destroyed by fire).

ALDERSHOT.—Roman Catholic Church in Station Road; additions to "St. Kilda," for Mrs. Bailey.

ALYTH.—Extension of Public School. Clerk of School Board, Alyth, Perthshire.

ARBROATH.—Extension of Lawton Mill Mansion House. John Addison, contractor, Arbroath.

ASCOT.—Vicarage in South Ascot (£2,000). Rev. B. B. Murray, vicar of South Ascot parish, Silcote House, South Ascot.

ASTON.—Music Hall and Theatre of Varieties in Potter's Lane, for Aston Hippodrome, Ltd. (new concern).

BANGOR.—Conversion of Tabernacle Church into Public Hall. W. G. Williams, architect, Bangor.

Hostel in connection with the Bangor Normal College (£25,000). H. T. Hare, architect, 13, Hart Street, Bloomsbury Square, W.C.

BARNSLEY.—Proposed reconstruction of Beckett Hospital and Dispensary. R. F. Pawsey, 8, Regent Street, Barnsley.

BECKENHAM.—Extension of Manual Training Centre, Alexandra Schools, for the U.D.C. J. A. Angell, surveyor to the U.D.C.

BEDDINGTON (near CROYDON).—Houses, Smitham Downs Road, for H. A. Rayner; Sandy Lane, for A. Martin; Peak's Hill Estate, for A. G. Wright.

BEDFORD.—Four houses in Tennyson Road, Jacob & Burton; house in Castle Road East, S. Constant; two villas in Kingsley Road, W. Braybrook; eight houses in Winifred Road, R. Jeakings; shop in St. Peter's Street, Ceylon and Indian Tea Co.; shops in High Street, Geo. Haynes, The Embankment.

BELFAST.—Warehouse in Chichester Street. W. J. Gillibrand, architect, 9, Howard Street, Belfast.

BEXLEY.—E.L. installations at houses in Hansol Road.

BIGGLESWADE.—Wesleyan Church at Upper Caldecote. Thos. Cockrill, architect, Biggleswade.

BIRKENHEAD.—Extensive additions to the Workhouse (£6,344). C. W. Davenport & Sons, builders, Stockton Heath, Warrington.

BIRMINGHAM.—Tramway depôt in Miller Street. Ingall & Son, architects, 3, Temple Row West, Birmingham.

BOLTON.—Houses, Brandwood Street, for W. and J. Leigh; alterations to premises, Deansgate and Crown Street, for R. Whitehead and Sons, Ltd.; additions to works, Nelson Square, for R. Hough.

BOOTLE.—Re-erection of business premises after fire for E. G. Toll, draper, Linacre Street.

BOURNE.—New Congregational Church.

BOURNEMOUTH.—Repairs, &c., at the Springbourne Infants' School.

Girls' School at Boscombe (£2,956). (John G. Norman, builder, 63, Victoria Road, Swindon (Wilts).

BOYLE (Co. ROSCOMMON).—New Post Office. H. Williams, secretary, Office of Public Works, Dublin.

BRADFORD.—Alterations to Drighlington Central Provided School, near Bradford, for the West Riding C.C. W. Wood, Divisional Clerk, Station Road, Batley.

Nurses' home and isolation block, municipal fever hospital. Town Clerk, Bradford.

Two semi-detached houses at Frizinghall. E. Marten, architect, 225, Swan Arcade, Bradford.

BRISTOL.—Premises at Southmead for the School of Industry for the Blind. Edward Gabriel, architect, 42, Old Broad Street, London, E.C.

New schools at Ashley Hill (£11,982). G. Humphreys & Son, builders, Woodboro' Street, Stapleton Road, Bristol.

Bakery at Whitehall, St. George, for the Bristol Co-operative Society, Ltd. (£40,000).

Extensive additions to the Royal Infirmary. W. E. Budgett, secretary and house governor.

BROADSTAIRS.—House, South Cliff Parade, for Mrs. B. Humble-Crofts.

BROMLEY.—Development of portion of Sir S. Scott's estate for building purposes; Messrs. Walford, solicitors, 27, Bolton Street, Piccadilly, W. Business premises, High Street; T. N. Marks, builder, Cranleigh, College Slip, Bromley. Houses, Alexandra Crescent, for C. Banks. Works at seven schools for the Bromley Education Committee.

BURSLEM.—Business premises, corner of Brickhouse Street and Queen Street, for W. H. Bailey & Sons, boot dealers. E. T. Watkin, architect, 7, Rushton Terrace, Rushton Road, Cobridge, Burslem.

CANTERBURY.—Cottage, Ada Road, Wincheap, for Mrs. A. Wiffen, Newhouse Road, Thannington. Daniel Tottman, 13, St. Jacob's Place, Wincheap.

Additions to Sturry Court for Lord Milner. W. J. Adcock, builder, 27, Castle Street, Canterbury.

CASTLEFORD (YORKS.).—Houses, Burnley Avenue, for Councillor Waite; Lower Oxford Street, for Mr. Jones; Nicholson Street, for W. Thompson.

CHELMSFORD.—Extensive alterations at the Lamb Hotel, and conversion of Victoria Rooms in Theatre. G. B. Shenton, manager of the new theatre.

CHESTER.—Extensive alterations and additions to premises of Messrs. Densons, Northgate Row, including electric lift.

CHESTERFIELD (GLAPWELL).—Stationmaster's house. A. L. Charles, secretary, Midland Railway, Derby.

CHIPPING CAMPDEN (GLOS.).—Alterations and additions to the Grammar School. R. G. Phillips, architect, Midland Bank Chambers, Gloucester.

CHORLEY.—Houses, Poplar Street, for W. & H. Martindale; Gillibrand Walks, for Miss Clayton; Critchley Street, for R. Baxendale & Sons, builders, Lyons Lane; Mission room, Red Bank, for Rev. G. Northridge.

COPTHORNE (SUSSEX).—Men's Institute on the Bank. Rev. W. R. Scott, Vicar of Copthorne.

COWES.—Houses, Mill Hill Road, for G. Gates.

CRESWELL.—Infants' schoolroom and caretaker's house (£600). Rev. F. B. Dutton, minister of the Creswell United Methodist Church.

CROMPTON.—Premises, Newtown, for the Pleasant Sunday Afternoon Society; Mission-room, Grains Bar, for Rev. S. T. Williamson; shop and bakery, Milnrow Road, for Crompton Co-operative Society.

CUDWORTH (YORKS).—Houses and shop, Syndale Road, for H. J. Dwight; houses, Churchfield Estate, for G. H. Gray; Pontefract Road, for Miss Celia Wray.

CARNARVON.—Renovation of Methodist Chapel. Evans & Jones, architects, 5, Station Road, Port Talbot.

DARLINGTON.—School at Harrogate Hill (420 scholars). G. Winter, borough surveyor, Town Hall, Darlington.

DARTFORD.—Houses (24), Carleton Road, for the Devonshire Building and Investment Co.; houses (14), at Fulwich Farm. T. Wooller, architect, Priory Villa, West Hill, Dartford.

Church. Rev. F. V. Baker, Vicar-designate, Christ Church, Dartford.

DEWSBURY.—Houses, Leeds Road. Kirk & Sons, architects, Dewsbury.

DORSET.—Repairs at 18 schools for the County Council Education Committee. B. R. Swift, Secretary, County Education Office, Dorchester.

DUBLIN.—National Schools in Lower Rutland Street. Mumby & O'Rourke, architects, 15, College Green, Dublin.

DUMFRIES.—Alterations to the day school in connection with St. John's Episcopal Church.

DUNBEATH.—New United Free Church. Mr. McDonald, architect, Thurso.

DUNDEE.—Alteration of property for Chris. Malloy at 151, Brook Street. Addition to works for Ogilvy & Smith, Erskine Street. Alteration of property for A. Matthew, Yeaman's Alley. Workshop for Urquhart, Lindsay & Co., Ltd., in Larch Street. Works at harbour for H. Knuck & Co., Dens Road. Villa in Adelaide Terrace for J. P. Ross, wine and spirit merchant. Alteration on property for Dundee, Perth and London Shipping Co. in Shore Terrace. Laboratory for University College, Dundee; secretary, College Council. Store for Wm. A. Martin in Park Wynd. Store for Urquhart, Lindsay & Co., Ltd. in Bellfield Street.

DURHAM.—Garage at Nevill's Cross for Thos. Phillipson.

EAST COWES.—Houses, Oakfield Road, for Mr. Brading, builder, East Cowes.

EAST POLLOKSHAWS (N.B.).—Halls in connection with St. Margaret's Episcopal Church (£1,500).

EASTWOOD (NOTTS.).—Proposed new school and cookery and laundry centre for the C.C. (£10,000).

FALKIRK.—Premises for Salvation Army. The secretary, Falkirk Corps, Salvation Army.

Extension of grinding shop and new warehouse for the Callendar Iron Co.

FELIXSTOWE.—Three private houses; F. Knight, builder, Felixstowe. Two private houses; W. F. Cross, builder, Felixstowe.

FELTHAM.—Enlargement of infants' school. H. G. Crothall, education architect, Middlesex County Council, Guildhall, Westminster, S.W.

FENNY STRATFORD.—Houses, Victoria Road, for E. J. Gayton; Oliver Road, for H. S. Pettit; Windsor Street, for J. Edwards.

FERNDALE (GLAM.).—Alterations and additions to Blaenllechan Radical Club. W. M. Lewis & Morgan, architects, Pontypridd.

FERNHURST (SUSSEX).—New village hall (£950). Vicar of Fernhurst.

FLEETWOOD.—Houses, Milton Street, for the British House and Land Assurance Co.; Galloway Road, for J. Woods; Derbishire Road, for P. R. Morris. Proposed secondary school. Housing scheme contemplated by District Council.

FOLKESTONE.—Enlargement of Acrise and Paddlesworth Council School. W. H. Robinson, architect, Kent Education Committee, Caxton House, Westminster, London, S.W.

FULWOOD (near PRESTON).—Proposed chapel. Rev. A. Dyson, Fulwood, near Preston.

GARVAGH (Co. DERRY).—Schools at Bolerin, for the Rev. J. M'Keefrey. J. V. Brennan, architect, Belfast Bank Chambers, Belfast.

GILLINGHAM (KENT).—Proposed music hall, for W. J. Mackay.

GLAMORGANSHIRE.—New school at Brynamman (Banwen); alterations to schools at Birchgrove (Llansamlet) and Cadle, near Swansea. T. M. Franklin, architect, Clerk to the C.C., Glamorgan County Offices, Westgate Street, Cardiff.

GLASGOW.—Double villa in Golfhill Avenue, Giffnock, for J. Taylor, Victoria Street, Larkhall; 9 houses in Dane's Drive, Scotstoun, for the Scotstoun Estate Building Co., Whiteinch; villa, corner of Kilmarnock and Tinto Roads, for J. Train, Rutherglen; double villa in Tinto Road, Hillpark, for G. Eadie, 405, Matheeson Street, Glasgow; villa in Calderwood Road, Newlands, for J. Train; villa at Netherton, Mearns, for P. Hardie, 7, Howard Street, Glasgow; engine and dynamo house at Newlandsfield, Pollokshaws, for Stevenson & M'Kellar, Pollokshaws.

Proposed St. Aloysius' Church, Rose and Hill Streets, Garnethill. C. J. Menart, architect, 241, West George Street, Glasgow.

Interior renovation of St. George's Parish Church (£300).

GOLCAR.—House, Bank Top, for H. E. Sykes; additions to the Conservative Club, Knowl Road.

GOOLE.—Alterations at the Theatre Royal, for F. Greaves, Royal Hotel.

GRIMSBY.—Wesleyan Methodist Church (£4,000).

HALESOWEN.—Conversion of Townsend House into Conservative Club premises.

HALIFAX.—Fireproof warehouse and offices, for Waller Bros., Onecliffe Mills, West Vale. Chas. F. L. Horsfall & Son, architects, Lord Street Chambers, Halifax.

New Pavilion for the King Cross Cricket and Bowling Club. J. Lord.

HALTON (LEEDS).—Parochial Hall (£1,100). Vicar of Whitkirk.

HARBY (NOTTS.).—New schools for the C.C. (£1,599). W. Crane, Ltd., builders 80, Forest Road West, Nottingham.

HARROGATE.—Houses, Cavendish Street, Bilton, for Carrick & Cundall; Albert Road, Bilton, for C. A. Nettleton, builder, Balmoral House, Bilton; Kent Road, for D. Simpson; Knox Farm, off Skipton Road, for W. Sheepshanks.

HARTSHEAD (YORKS.).—Wesleyan Methodist Sunday Schools (£800).

HASLINGTON (CHESHIRE).—New Wesleyan Chapel. J. Martin, architect.

HAYES (MIDDLESEX).—Two shops, Clayton Road, Hayes Development Co., Hayes; four houses, for Great Western Railway Co.

HESWALL (CHESHIRE).—New Presbyterian Church (£4,000). Mr. Tapscott, Chairman, Building Committee.

HEYWOOD.—Bank premises for the Union Bank of Manchester. S. Barker, builder, Pilsworth Road, Heywood.

HODDESDON.—New church at Rye Park (£7,000). Dudley Newman, architect, Westminster, London; J. A. Hunt, builder, Hoddesdon.

HORNCASTLE (LINCS.).—Grammar school. Scorer & Gamble, architects, Bank Street Chambers, Lincoln.

HULL.—Alterations to premises, Prospect Street, for H. Goltman. B. S. Jacobs, architect, Lincoln's Inn Buildings, Bowlalley Lane, Hull.

ILFORD.—Two houses for A. C. Corbett; E. T. Dunn, architect, 7, Roding Street, Ilford. Extensions to Convent School, Moreland Road; Scoles & Raymond, architects. Two houses, 83 and 85, The Drive; W. P. Griggs & Co., Ltd.

IRLAMS-O'-TH'-HEIGHT (near MANCHESTER).—Block of houses off Claremont Road. J. Ward, builder, Irlams-o'-th'-Height.

ILKESTON.—Proposed extension of the Parish Church (£4,500).

KING'S NORTON.—Congregational Chapel in Watford Road (£2,500). Ewan Harpen & Brother, architects, Birmingham.

LAGGAN (KINGUSSIE).—New Manse for United Free Church at Laggan. A. Cattanach, architect, Kingussie.

LANCASTER.—Four dwelling houses in Ulster Road; Hodgson & Bowker, builders. Four dwelling houses in High Caton Road; W. Taylor, builder. Three dwelling houses in Wingate Saul Road; J. N. Grubb, builder.

LEAGRAVE (BEDS.).—Houses, New Road, for John Hill; Icknield Road, for Mr. Jefford; Marsh Road, for Day & Fensome.

LEEDS.—Alterations to Gildersome Street Lane Provided Schools, near Leeds, for the West Riding C.C.; W. Wood, Divisional Clerk, Station Road, Batley. New Sunday Schools for St. James's parish; S. D. Kitson, architect, Greek Street Chambers, Leeds.

LETCHWORTH.—Proposed free church (£5,000).

LINCOLN.—New club house at the Shakespeare Inn, High Street. A. and B. Hall, owners.

LOFTUS (YORKS.).—House and shop, Carlin How, for Oates & Co.

LISBELLAW (Co. FERMANAGH).—Presbyterian Church. W. Scott, architect, Victoria Terrace, Enniskillen.

LITTLEBOROUGH (LANCS.).—Extension to the Reform Club premises. J. Horsfall, architect, 4, Chapel Walks, Manchester.

LIVERPOOL.—Proposed new parochial hall for St. Mary's parish, Wavertree. (£2,000). Rev. H. E. Whateley, rector.

LLANDINAM (MONTGOMERYSHIRE).—New vicarage. Rev. Jas. Jones, vicar.

LONDON (LEWISHAM, S.E.).—Two houses in Heathier Road. A. Durbin, builder, Grove Park, S.E.

(LEWISHAM, S.E.).—Six houses, Culverley Road. T. A. Boughton, builder, 87, Calverley Road, S.E.

(LEWISHAM, S.E.).—Ten houses, Chalcroft Road. W. J. Saldamore & Sons, builders, 18, Manor Lane, S.E.

(LEWISHAM, S.E.).—Twelve houses, Muirkirk Road, and twenty-two houses, Ardoch Road. Norfolk & Prior, architects, Catford, S.E.

(BALHAM, S.W.).—Additions to Clapham College. Holliday and Greenwood, Ltd., builders, Loughborough Park, S.W.

(TOOTING, S.W.).—Three shops and houses. Style & Winch, brewers, Electric Avenue, Brixton, S.W.

(CLAPHAM, S.W.).—Additions to public library. J. Garrett & Son, builders, 83, Balham Hill, S.W.

(PUTNEY, S.W.).—Houses, record office and pavilion, Priory Lane. J. C. Radford, architect, 223, Upper Richmond Road, Putney.

(KINGSLAND ROAD, N.E.).—Factory. W. H. Cone, builder, 80, Alkham Road, Dalston.

(CHELSEA, S.W.).—Alterations to Fire Station. W. E. Riley, supt. architect, L.C.C., Spring Gardens, S.W.

(STREATHAM, S.E.).—Twenty houses, Wavertree Road. Chappell and Utting, builders, 24, Wavertree Road, Streatham.

(FULHAM, S.W.).—Vicarage, Margravure Road. Sir Aston Webb and E. Ingress Bell, architects, 19, Queen Anne's Gate, S.W.

(HACKNEY, N.E.).—Factory, &c., Foulden Road. C. Gordon Smith, architect, 55, Cannon Street, E.C.

(W.C.).—Development of site, Gate Street. Barlow & Roberts, builders, 15, Red Cross Street, S.E.

(OLD FORD, E.).—Building, Armagh Road. W. A. Finch, architect, 76, Finsbury Pavement, E.C.

(BLACKHEATH, S.E.).—Proposed new School. Managers of St. John's C.E. School, Russell Place, Blackheath.

(SOUTHWARK, S.E.). — Additions to School. Managers, Christ Church C.E. School, Bear Lane, Southwark.

(HENDON, N.W.).—Eight houses in Middleton Road. E. Streather, builder, Sanderstead Station, Croydon.

(HENDON, N.W.).—Two houses in Woodstock Road. J. Gibb, jun., builder, Golder's Green Road, N.W.

(UPPER HOLLOWAY, N.).—Additions to St. John's Road Workhouse. Greenaway & Newberry, architects, 21, Queen Anne's Gate, S.W.

(WALTHAMSTOW, E.).—Alterations to 65 to 75, Carlton Road. C. W. Hodgston, architect, 259, High Street, Walthamstow.

(WALTHAMSTOW, E.).—Seven houses, Pentire Road. H. Brodey, architect, 259, High Street, Walthamstow.

(LEWISHAM, S.E.).—Extensive alterations at premises of A. Farbrother, draper, 92, High Street.

(GOLDER'S GREEN ROAD, N.W.).—Eight houses. R. Vernon Hart, builder, Burgess Park, N.W.

(HAMPSTEAD, N.W.).—New Roads, Garden Suburb; and thirteen houses, Hampstead Way. Unwin, Parker & Unwin, architects, Wildes Farm, North End, N.W.

(HENDON, N.W.).—Sixteen houses. Improved Industrial Dwellings Co., 33, Finsbury Square, E.C.

(HENDON, N.W.).—Twenty houses in North End Road and Park Drive. W. J. King, builder, 7, Heath Street, N.W.

(HAMPSTEAD, N.W.).—Two houses, Temple Fortune Hill. Hampstead Tenants, Ltd.

(HAMPSTEAD, N.W.).—Three houses. Carshalton District Development Co., 1, Hill Road, Sutton.

(POPLAR, E.).—Additions to St. Matthias' Schools. Fred. and T. Thorne, builders, 266, Manchester Road, E.

(POPLAR, E.).—Steam motor garage and additions at Sun Flour Mills, St. Leonard's Street. John Hall & Son.

(HAMPSTEAD, N.W.).—Re-erection of Old Black Lion beerhouse. E. Faux, care of Courage & Co., brewers, Horseleydown Lane, S.E.

(BERMONDSEY, S.E.).—Shop in Upper Grange Road. T. Sloman, builder, Cowan Street, S.E.

(BOW, E.).—Building, Smeed Road. H. C. Smart, architect, Oakleigh, Teesdale Road, Leytonstone.

(KENSINGTON, W.).—Development of new streets. W. G. Hunt, architect, 17, Vicarage Gate, Kensington, W.

(STEPNEY, E.).—Building, Christian Street. M. W. King & Son, surveyors, 6, Holborn Viaduct, E.C.

(WHITECHAPEL ROAD, E.).—Additions to shop, No. 75. W. G. Brown, builder, 190, Mile End Road, E.

(CATFORD, S.E.).—Shop, Rushey Green. Norfolk & Prior, architects, Catford.

(MITCHAM ROAD, S.W.).—Buildings between Glasford Street and Otterburn Street. Robertson & Barry, builders, 1, Renmuir Street, Tooting.

(SOUTH TOTTENHAM, N.).—Additions to St. Ignatius College, High Road.

(TOTTENHAM, N.).—Additions, &c., to St. Mary's Priory, St. Anne's Road.

(TOTTENHAM, N.).—Twelve houses, Keston Road. T. Rowley, builder, 462, West Green Road, Tottenham, N.

(TOTTENHAM, N.).—Sixteen houses, Gorleston Road. W. G. Rowley, builder, 278, Philip Lane, Tottenham, N.

(OXFORD STREET, W.).—Re-erection of Princess's Theatre (£55,000). Joseph Lyons, Cadby Hall, Kensington, W., Chairman of Board of Directors.

(ISLINGTON, N.).—Rebuilding premises (partially destroyed by fire) for W. V. Aldridge, wholesale oilmen, Islington Green, N.

(ANERLEY, S.E.).—Additions to North Surrey District School. Cecil A. Sharp, architect, 11, Old Queen Street, Queen Anne's Gate, S.W.

(EAST HAM, E.).—Twenty-one houses in Montpelier Gardens. F. Hamlett, builder, "Cotswold Works," Barking Road, E.

(DULWICH, S.E.).—Two hundred houses in Woodwarde Road. W. G. King, secretary and general manager, Dulwich College Estates, Dulwich, S.E.

(FULHAM ROAD, S.W.).—Development of street. Elms & Jupp, architects, 25, Sackville Street, W.

(TOTTENHAM, N.).—Forty-seven houses, Rosebery Avenue. G. W. Rowley, builder, 278, Philip Lane, Tottenham.

(TOTTENHAM, N.).—Block of flats, High Road. G. W. B. Bolton, architect, 11 and 12, Finsbury Square, E.C.

LONDON (SPITALFIELDS, E.).—Roman Catholic Schools (£8,000) for the Sisters of Mercy.

(HENDON, N.W.).—Nine shops in North End Road. A. W. Cleaver, architect, 54-5, London Wall, E.C.

LUMPHANAN (ABERDEENSHIRE).—Additions to Sunnybrae House. Cochrane and Macpherson, advocates, 152, Union Street, Aberdeen.

LUTON.—Extension to fan and motor house at the works of the Davis Gas Stove Co. Houses, Newcombe Road, for G. Angell; Hartley Road, for C. W. Jakins; Frederic Street, for F. Whitby; Clipston Road, for E. Hillyard; Kenilworth Road, for T. Day; Smart Street, G. Kingham, builder, 106, Old Bedford Road, Luton; Conway Road, for A. Carter; Ridgway Road, A. Cole, builder, 188, High Town Road, Luton; business premises, Chapel Street, for C. W. Deacon.

LYDNEY (GLOS.).—Villa residence, Aylburton, for Mrs. Hopkins.

MAIDSTONE.—Houses. Pine Grove, for R. Highham; additions to premises in King Street, for Herbert Monckton, solicitor.

MANCHESTER.—Mission Church in connection with the Bradford Memorial school (£2,200).

(CHEETHAM).—Extension to the Victoria Memorial Jewish Hospital (£3,000). Dr. Adler, Chief Rabbi.

(NEWTON HEATH).—New Sunday schools. Smith & Matley, architects, Ridgefield, Manchester; Young, Tinker & Young, builders, Miles Platting.

MANSFIELD.—Business premises, Albert Street, for J. H. Blake, J.P., ironmonger; houses, Bould Street, for T. H. Ladyman; Albion Street, for John Lucas; Murray Street, for C. G. Bradder; Goldsmith Street, for A. J. Copestake; Carter Lane, for Somercotes Permanent Land Society; Victoria Street, for Geo. Boot; Moor Street, for R. Pilbeam; York Street, for the Co-operative Society; Nottingham Road, for J. A. Robinson; Victoria Street, for Miss R. Brailsford; Quarry Lane, for H. Hallam.

New Church (St. Lawrence) (£3,035). L. H. Westwick, architects, T. & R. Moore, builders, Mansfield.

MARKET RASEN.—Liberal Club premises. C. R. Herring, Market Rasen.

MARSDEN (YORKS.).—Conservative club premises (£2,000). J. A. Brooke, President of the Colne Valley Conservative Association.

MENAI BRIDGE.—Additions and alterations to schools. Jos. Owen, architect, Menai Bridge.

MELKSHAM (WILTS.).—Baptist Sunday schools (£1,150). W. W. Snallum, architect, Trowbridge; Bigwood & Co., builders, Melksham.

MELROSE.—Prospective rebuilding of the Parish Church (recently destroyed by fire).

MIDDLESBROUGH.—Post office at South Bank. Kitching & Lee, architects, 21, Albert Road, Middlesbrough.

MILNSBRIDGE (near HUDDERSFIELD).—Extension of Burdett Mills for Armitage Bros., worsted manufacturers. Abbey & Hanson, Cloth Hall Street, Huddersfield.

MITCHAM.—Parochial hall (£3,900). Rev. E. J. Baker, Vicar of St. Barnabas, Mitcham.

MONEYMORE (LONDONDERRY).—Protestant Hall in Gortagilly; E. Higginson, Gortagilly, Moneymore. Residence for the Rev. E. M'Alevy; J. V. Brennan, architect, Belfast Bank Chambers, Belfast.

MORCHARD BISHOP (DEVON).—Shop and dwelling-house for G. Burrow. C. E. Ware & Son, architects, 18, Bedford Circus, Exeter.

NEWQUAY (CORNWALL).—House at Headland for Leslie Williams. G. Miners and Son, builders, Marazion.

NEWRY.—Premises in Hill Street, for R. Foster, Ltd. S. W. Reside, architect, Margaret Square, Newry.

NORFOLK.—Alterations and extensions at schools for the Norfolk Education Committee. Secretary, Education Offices, Shirehall, Norwich.

NORTH BIERLEY (YORKS.).—Extensions to the workhouse for the Board of Guardians. W. Mortimer, chairman of the North Bierley Guardians.

NOTTINGHAM.—Institute in connection with Emmanuel Church (now building).

OSSETT.—Sub-station, house, and offices for the Yorkshire Electric Power Co. J. W. Burrows, architect, Birstall.

OULTON BROAD (SUFFOLK).—Conversion of school into a special subjects centre. W. E. Watkins, secretary, East Suffolk County Education Committee, County Hall, Ipswich.

PENZANCE.—Tonic nerve food factory for a German firm. Negotiations carried out by W. J. Hosken, Fulsack, Hayle.

PERTH.—Three double villas, at Muirton Place; Beat Bros., builders, Perth; dwelling-houses at Shore Road, Friarton; Thomas Leith, builder, Perth.

PORTH (RHONDDA).—Welsh Calvinistic Methodist Schoolrooms.

PORTHCAWL (GLAM.).—New womens' block for 26 patients, and new men's block for 20 patients for The Rest, Porthcawl. E. R. Bruce Vaughan, 21, Dumfries Place, Cardiff (architect).

PUDSEY.—Cloth premises, &c., at South Park Mills. S. Spencer, architect Old Bank Chambers, Great Horton, Bradford.

RATTRAY.—Proposed United Free Church. Minister, U.F. Church, Rattray.

RHOSNEIGR (ANGLESEY).—New Council School. J. Owen, architect, Uxbridge Square, Menai Bridge.

ROCHDALE.—Central Church Hall in Water Street (£30,000).

ROUNDHEY (LEEDS).—Conversion of the C.I. Chapel into a central hall.

ST. ANNES.—Structural alterations at railway station, for the L. & Y. Railway, Hunts Bank, Manchester.

ST. ALBANS.—Alterations and additions, including motor garage, lounge, &c., at Red Lion Hotel, for Stanley Alcock.

ST. HELENS.—New schools, Cleveland Street, for Rev. J. J. Barry.

SHEFFIELD.—Extensions to the Town Hall under consideration.

(WOODSEATS).—Catholic Church at Meadow Head (£3,000).

SHIPLEY (YORKS.).—Ten houses at Dockfield, for the U.D.C.; surveyor to the U.D.C., Manor House, Shipley. E.L. installation at Sir Titus Salt's Charity Hospital; W. Fry, secretary.

SKIPTON.—School in Brougham Street, for the West Riding Education Committee.

SOUTHALL.—Girls' and infants' school (800 places). H. G. Crothall, Education Architect, Middlesex County Council, Guildhall, Westminster, S.W.

SOUTHEND-ON-SEA.—Alterations and additions to Brewery Road Schools for the T.C. E. J. Elford, borough engineer.

STICKEORD (LINCS.).—Elementary school and master's house. Scorer and Gamble, architects, Bank Street Chambers, Lincoln.

STOCKFORT (HEATON NORRIS).—New schools for St. Mary's parish (£2,000). O. C. Hill, architect, 9, Albert Square, Manchester; J. Briggs, builder, Stockport.

STOKE-ON-TRENT.—Electrical ventilation of the Board Room. A. R. P. Piercy, architect to the Building and Estates Committee.

STOKESLEY (YORKS.).—Improvement and enlargement of Broughton School. Bottomley, Son & Wellburn, 28, Albert Road, Middlesbrough.

STOPSLEY (BEDS.).—Houses, Ramridge Road, for G. Smith.

STRATHMIGLO (FIFE).—Additions to Gateside School. W. Birrell, architect, Kirkcaldy.

TAIN.—New buildings at public school. The clerk, School Board, Tain.

TAUNTON.—New vestry at St. Mary's Church (£500); electric light already in main building. F. H. Price, architect, Taunton.

TODMORDEN.—New place of worship, Nazebottom. Thos. Pickles, builder, Midgley.

TROON.—Double villa in Titchfield Road for Wm. Brown, Welbeck Crescent, (£1,800).

UPPINGHAM.—Alterations at Uppingham School Swimming Baths. F. H. Bancroft, civil engineer, 88, Mosley Street, Manchester.

WAKEFIELD.—Smallpox hospital in Carrgate. Wakefield and District Smallpox Committee.

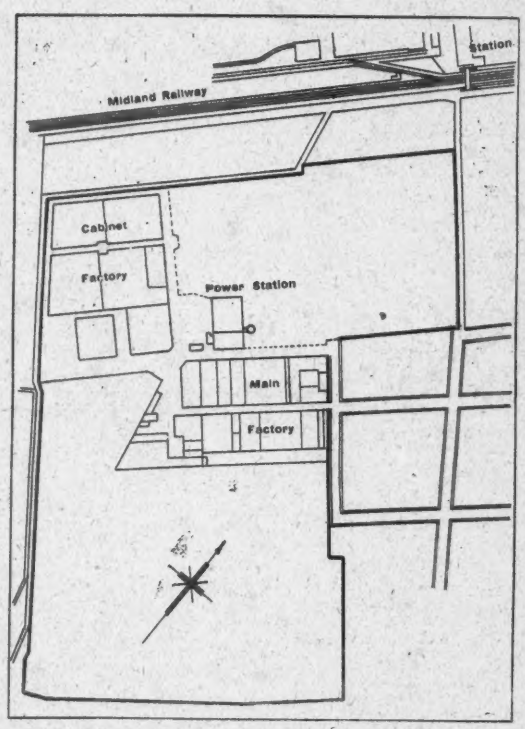
Garden City scheme promoted by the New Scarborough Adult School.

WALLINGTON (SURREY).—Houses, Park Hill Road, for F. Hill; Heathdene Road, for W. H. Wilson; Wolseley Road, for R. Joyce; Mint Road, for W. Baldwin; church and presbytery, Stafford Road, for Canon St. John.

WATFORD.—Vagrant wards at workhouse. J. L. Tyler, builder, 133, Vicarage Road, Watford.

WHITSAND BAY (near MILLBROOK, PLYMOUTH).—Whitsand Bay Hotel and bungalow on same site for Lady Beatrice Pole-Carew. J. Gilbert, jun., architect, Treval Estate Office, Torpoint, Plymouth.

WICK.—New school and school extensions (£14,297). Clerk to the School Board, Wick.



PLAN OF BEESTON WORKS (see next page).

WIGAN.—Houses, Platt Lane, for Wm. Knowles; Neville Street, for J. Hodgkinson; High Street, for Mrs. M. Saxon; Ridyard Street, for Mrs. M. A. Swift; offices, for the Worsley Menes Ironworks Co.; alterations to Crawford House and Crawford Buildings, for Pendlebury & Co., Ltd., drapers; alterations to Queen Anne Buildings, Wallgate, for the Union Bank of Manchester; entrance lodge, for the Earl of Crawford.

WIGTON.—New Police Station and Court House for Cumberland C.C. Geo. Dale Oliver, county architect, Carlisle.

WORCESTER.—Extension to Severn Street. St. Alban's Home.

WORTHING.—Convalescent Home in connection with the Royal Surrey County Hospital, Guildford (£10,000).

WREXHAM.—Detached house, corner of Spring and Cunliffe Streets. J. E. Tate, architect, 9, High Street, Wrexham.

YARDLEY.—Extension of the Isolation Hospital at Llydon End, for the U.D.C. (£1,000).

YNYSDDU (MON.).—28 houses for the Brynscawen Building Club. W. A. Griffiths, architect, Pontllanfraith, Newport, Mon.

YNYSHIR (RHONDDA VALLEY).—Welsh Calvanistic Methodist Chapel.

YORKSHIRE (WEST RIDING).—Alterations, additions, improvements, &c., at nine schools for the West Riding Education Committee. J. Vickers-Edwards, county architect, County Hall, Wakefield.

Appointments Vacant.—The Pacific Cable Board is open to receive applications for the post of general manager of the Board; applications have to be lodged by July 20th. Shift engineer for Burton-upon-Trent (£2); foreman wireman to give instruction in electric wiring at the Borough Polytechnic Institute.

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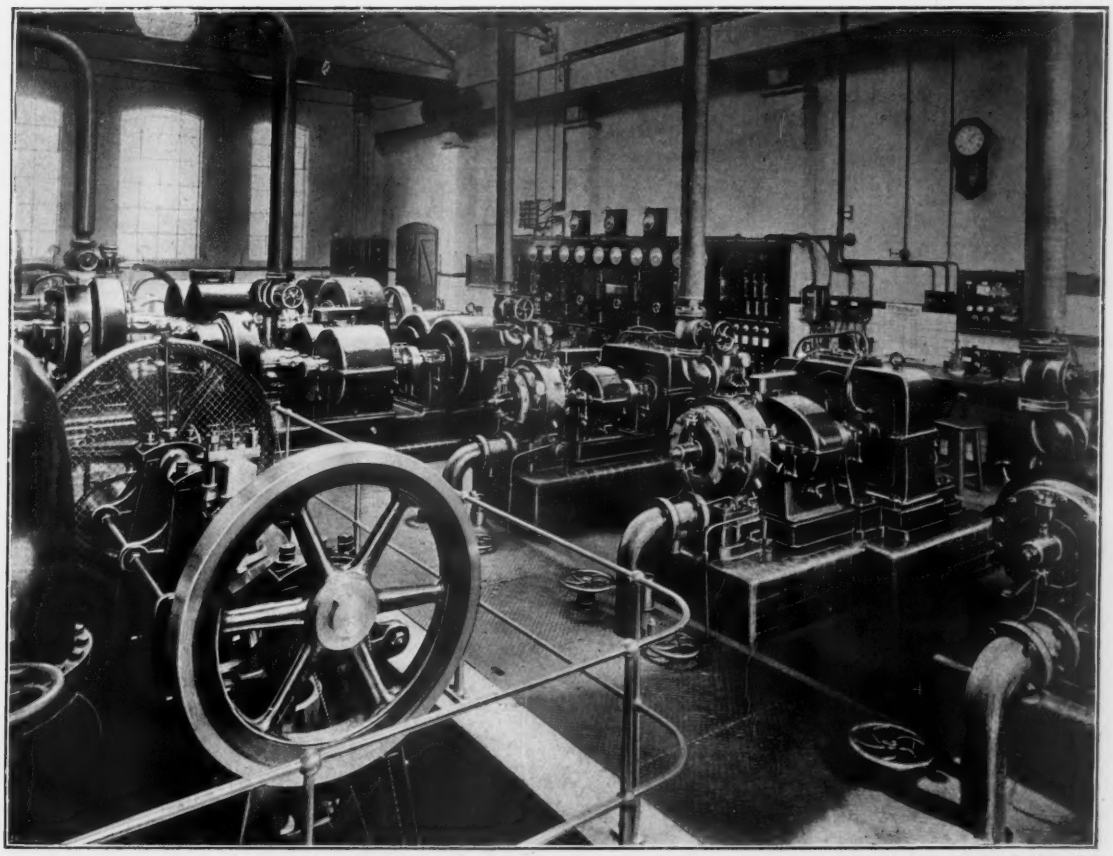
THE BEESTON WORKS OF THE BRITISH L.M. ERICSSON MANUFACTURING CO., Ltd.

A short time ago we visited the works of the British L.M. Ericsson Manufacturing Co., Ltd., at Beeston, Notts., and obtained information about the developments which have taken place in these works of late.

Originally a factory was started there for making telephone material by the National Telephone Co., Ltd., in 1901, and this was taken over by the British L.M. Ericsson Manufacturing Co., Ltd., who are the sole representatives in this country of Messrs. L.M. Ericsson & Co., of Stockholm, the well-known telephone manufacturers, in 1903. Shortly before the transfer, most of the old factory was destroyed by fire, and in the rebuilding it was greatly altered and extended by its present owners. In 1904 the factory premises were again extended, and a new power station was built, the old plant being transferred to it, and a good deal of new machinery installed. In 1906 and 1907 a large new building was erected, chiefly devoted to cabinet work.

Bird's-Eye View of Works.

On the accompanying plan (p. 18) the general lay-out of the works is shown. The old factory building covers an area of 63,000 sq. ft., and the cabinet factory 70,000 sq. ft., whilst the power station has an area of 7,000 sq. ft., making a total covered space of 140,000 sq. ft. There is plenty of scope for extensions, as the company is the owner of nearly 20 acres of freehold land round the factory buildings. The Beeston Station of the Midland Railway is within a few minutes' walk from the works, and quite a number of workmen's cottages are springing up round the place to provide accommodation for the employés, between 500 and 600 persons being at present employed at the works.



Power Station: De Laval Turbo-Dynamos.

The buildings have naturally been laid out on the most modern lines, and are all of the one-floor pattern, with electric drive everywhere. The power station is of exceptional interest, the whole of the generating plant consisting of Messrs. Greenwood & Batley's de Laval turbo-generators.

The owners are well satisfied with this type of generator, which they find steady-running and economical, not only at full load but also on a light load. There were originally three 50-H.P. turbines, each driving two dynamos, giving jointly 33 KW. at 110 volts. Formerly the armatures were coupled in parallel, the works being fed at 110 volts, but for the extensions a pressure of 220 volts was adopted, and the armatures were coupled in series. The three-wire system is employed in the "old" factory, to supply the original motors at 110 volts, but all new motors are made for 220 volts. The generators above mentioned, which are driven at 1,500 R.P.M. through the usual 10 to 1 reduction gearing, serve as balancers as well as generators, and are capable of taking a load 50 per cent. out of balance.

A larger set was also installed, of 225 H.P., giving 154 KW. at 220 volts; the turbine in this case runs at 10,000 R.P.M., and the twin generators at 1,000 R.P.M. The steam consumption has been ascertained to be as follows:—With saturated steam, at 160 lb. per sq. in., and with a vacuum of 27·5 in. of mercury: at full load 24 lb. per KW.-hour, and at half-load 27·5 lb.

Lastly, last autumn a 385-H.P. set was installed, of the latest type, with nozzles all round the rotor; this set gives 265 KW., and consumes at full load 21·75 lb., at three-quarter load 23·7 lb., and at half-load 25·5 lb. of steam, under the same conditions as before. There is still room in the power station for two more large sets and two more boilers.

Assembling Shop (Main Factory).

A jet condenser is installed, with Edwards air pumps driven by a motor; the condensing water is derived from an 18-in. bore-hole carried down into the gravel strata.

The main switchboard is of the three-wire type, and, with the rest of the plant in the power station, was supplied by Messrs. Greenwood & Batley. There are separate bus-bars for lighting and power, and the mains to the two factories are provided with separate meters.

The boiler house contains three boilers, one of which is fitted with a Henderson stoker burning shavings, &c., drawn direct from the cabinet factory by a dust exhaust plant. Each of the boilers, which are of the Lancashire type, measures 30 ft. × 8 ft. 6 in.; two of them are hand fired.

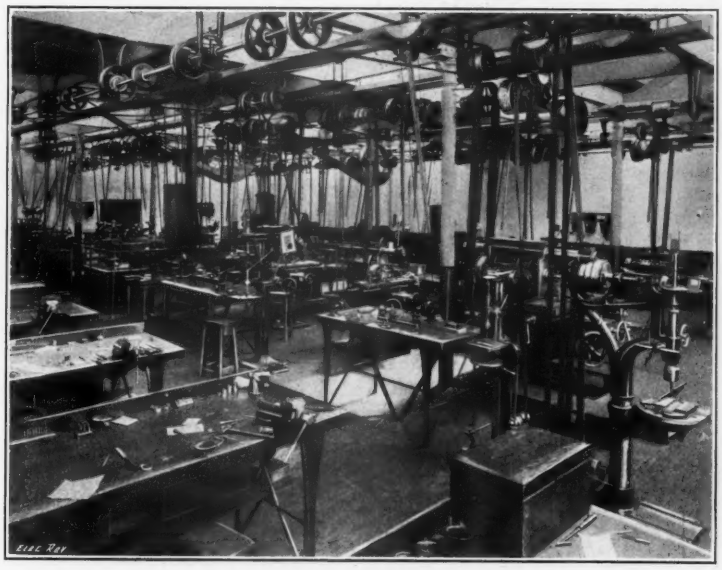
A Green economiser of 308 pipes is provided in the boiler house, and arrangements have been made to facilitate the adoption of superheating at a future date. Weir feed pumps are used, drawing from an underground tank of 120,000 gallons capacity, which is fed by rain-water collected from the roofs of the buildings, the water from the bore-hole being very hard. The tank can also be fed from the town mains. The chimney is of brick, 120 ft. high.

Metal Machine Shop.

Adjoining the power station is a pump room, where a Mather & Platt steam pump capable of delivering 1,000 gallons per minute is installed. This pump draws either from the tank or the bore-hole, and feeds the Grinnell sprinklers—of which a complete system is installed throughout new portions of the works—and the fire hydrants.

The mains are carried underground between the buildings, to distribnting boards, which in the old building are equipped for equalising the load on the two sides of the three-wire system, and are arranged so as to facilitate the ultimate change-over to 220 volts.

The motors driving the machines in the shops vary in size from 2½ to 70 H.P. Most of the 220-volt motors are of Westinghouse make. The wiring is in steel slip-joint tubing, and the controllers are ironclad. The motors and wiring were erected by the works staff. The grouping system is generally adopted, with the motors mounted in the roof. The main shafting is carried on Hyatt roller bearings, preliminary trials having shown the great superiority of these over the ordinary swivel bearings. The advantage of being able to test the power absorbed by the shafting from time to time, and thus to detect any irregularity, is fully appreciated.

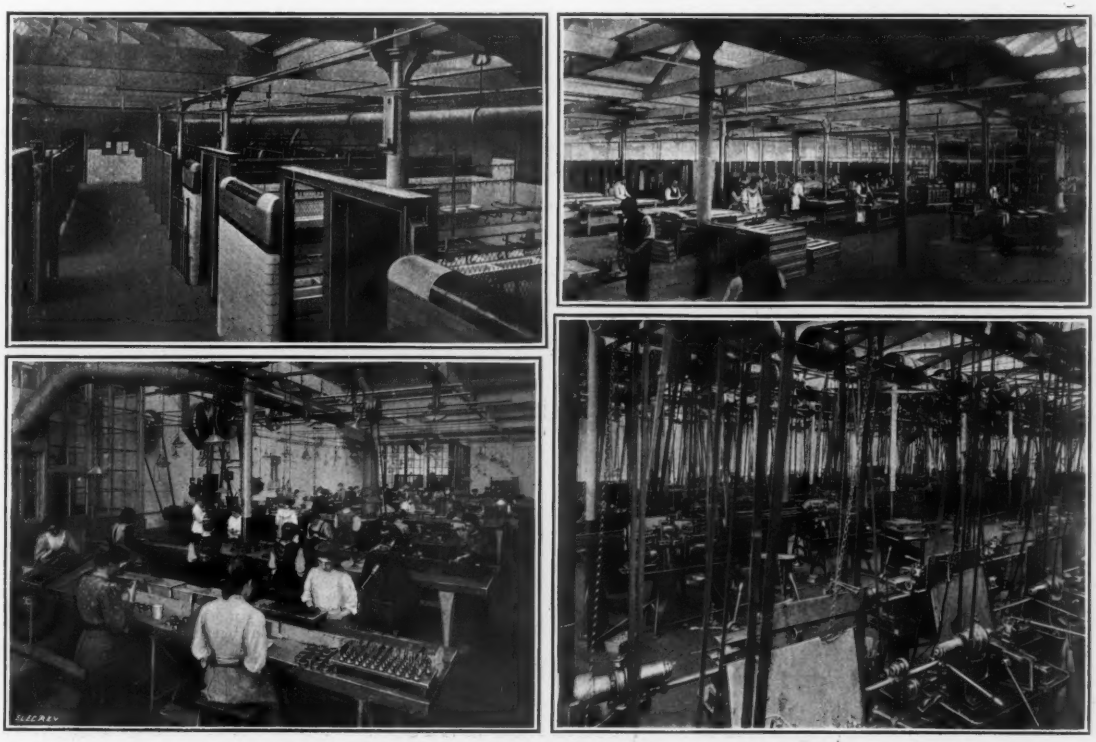


Tool Room.

All the shops are of the saw-tooth type, with northerly lighting; the roof is of timber, carried on cast-iron columns. Central corridors are provided through all the shops, and easy-running trucks are used for the transport of materials. The whole of the buildings are heated on the Sturtevant hot-air system, making the workshops very comfortable in winter, while in summer cool air is circulated through them. The provision made for the personal comfort of the employés is especially worthy of notice, as British factories are not always satisfactory in this respect. Ample cloak-room and lavatory accommodation is provided, and the employés pass through the former on their entrance into the building, leaving their outer garments there. We give a view of the lavatories, showing how, by means of white enamelled brick walls and modern fittings, wash-basins, &c., cleanliness and order are secured. Adjoining the lavatories there is an ambulance room, fully equipped for "first aid" in case of accidents.

The old factory building is chiefly devoted to the manufacture and assembling of metal and vulcanite parts, and the new factory building to cabinet-making and the final assembling of instruments, switchboards, &c.

The metal machine shop, which is shown in two of our views, contains approximately 60 automatic screw machines of various sizes, many of them fitted with slotting, drilling



Lavatories and cloak rooms.
Coil winding shop.

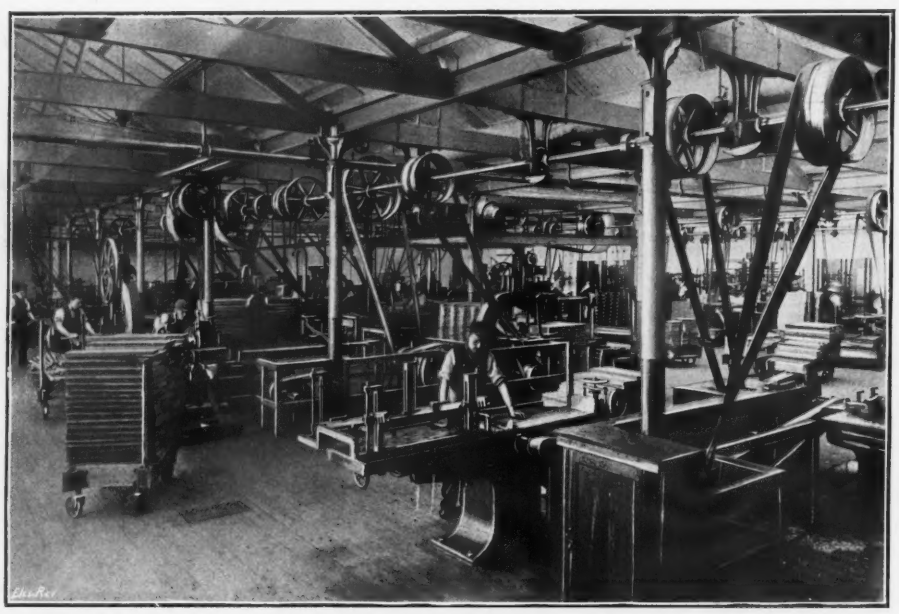
Cabinet shop.
Part of metal machine shop.

Views in the Beeston Works.

and other attachments. They are almost exclusively of the most approved American patterns. In addition to these there is a fair number of turret lathes of various sizes, drilling machines for all purposes, milling and riveting machines, &c. A portion of the machine shop is occupied by a fine assortment of presses of various sizes. The whole of the machinery is of the very latest types, and is specially adapted for making cheaply and accurately any small turned or stamped parts that may be required for practically any purpose. In the press work some remarkable results are obtained, more especially in the way of deep drawing work.

Attached to this shop there is a big and very well arranged fire-proof tool store containing an extensive assortment of high-class tools for all purposes. These tools are mostly made on the premises, and for this purpose a large tool shop is used, liberally equipped with the best Brown and Sharpe milling and grinding machinery, &c.

Polishing Shop.



Saw Mill and Wood Machine Shop.

In a central position in the building there is a large store for raw material and parts of apparatus, which are received there from the various shops and kept handy for re-issuing to the assembling shops.

At one end of the building there is good accommodation for the packing rooms, and also an extensive fire-proof warehouse for ready material.

Close to the stores there is a plating and polishing department fully equipped for silvering, nickel-plating and bronzing. The low-voltage current used for these purposes is supplied by a special motor-generator.

Adjoining this is the large coil-winding department, where girls are mainly employed. Several patterns of automatic winding machines are used here, ensuring a large output. In this shop lacquering work is also carried out, but there is a complete, well-equipped japanning department in another portion of the building. Electrical heating is used in the winding shops for several purposes, such as soldering, melting paraffin, &c.

Assembling and Finishing Department.

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In this building there is also a large assembling shop for metal and vulcanite parts, and here a great number of bells, switches, relays, indicators, spring-jacks, and all kinds of accessories can be seen in process of assembling.

A special shop is provided for heavy iron work with all the necessary machinery for making switchboard frames, &c., and furnaces for hardening magnets, gas furnaces, a smith's forge, special arrangements for hardening high-speed steel for cutters, &c.

There is also a special test room, comprising physical and chemical laboratories, and a research department, which is equipped with artificial cables, Cohen's barretter and other special apparatus for testing the efficiency of transmission, &c. All new types of instruments or parts are systematically tested in this department.

For the convenience of the employés there is a well-equipped mess-room, with accommodation for 275 men and 60 women, in which the employés not only have their meals cooked, but are also supplied with certain articles of food at cost price. The room is kept very clean and tidy, and it is to be noted that it is managed by a woman, which, perhaps, has something to do with its cleanliness.

Shop orders are made out for every part that is manufactured, and a highly organised system of cost keeping is in vogue. Limit gauges are largely used, and a high degree of accuracy is obtained in order to secure perfect interchangeability. All the work is carefully examined, both while in progress and when assembled, before it is sent out from the works.

The new factory building is chiefly devoted to cabinet work, but one shop is set aside for the wiring and assembling of telephone instruments, switchboards, &c. This building is divided into four large shops, entirely isolated from each other by fire-proof walls, carried through the roof, and iron doors. They are also protected by Grinnell sprinklers fed primarily from a tank at the top of the tower, holding 15,000 gallons, and secondly from a steam fire pump. Sturtevant heating apparatus for hot air is also installed in the sprinkler tower.

To ensure cleanliness and good work, all the machines are fitted with Sturtevant's dust exhaust, and the shavings are carried, by means of two large fans driven by a 50-H.P. motor, through a big trunk right across the open yard to the power station, where they are automatically fed into the boilers.

Outside this building there is a well-built timber shed, where all the wood is kept for a fair time for air-drying. From there it is taken into four large drying stoves, fitted with Sturtevant hot-air apparatus, where it is finally dried. To ensure that the wood is absolutely dry and reliable before it is worked up, the timber when taken from the drying stoves is kept in an extensive and very well-arranged dry timber store for some time for after-drying, and this apparently gives very good results.

In the large saw-mill a great variety of special machinery is found, of the most up-to-date kind, such as saws for various purposes, automatic joining machines, tenoning machines, triple drum sanders, spindles, drills, lathes, lock-corner machines, &c. Special methods are used to ensure the highest quality of cabinet work and absolute interchangeability, which is of great importance when making repetition work in large quantities.

The next shop is devoted to bench workers, and is also very efficiently equipped for its purpose. From there the work goes to the polishing department, where nearly all the polishing is done by machinery, a very carefully thought-out system of varnishing and drying rooms being attached to this shop. The results obtained by the use of the polishing machines are very good, giving a dull polish far superior in artistic effect to the ordinary so-called French polishing.

The last shop in this building is devoted to the final assembling and wiring of all kinds of telephone instruments, wall switches, switchboards, &c.

During our visit to the works we noticed a great variety of all kinds of telephone material, both for magneto and common-battery work, in progress, most of it being to the order of the General Post Office and the National Telephone Co., Ltd. The works appear to be exceptionally well equipped throughout with the most modern machinery and appliances for producing any kind of high class cabinet and metal work. In several of the shops mercury vapour lamps of the Westinghouse pattern are successfully employed, the light giving very good satisfaction, although it is understood that the vacuum tubes are not yet all that could be desired in the way of uniformity.

We are indebted to Mr. P. Hammarskjöld, the managing director, and to Mr. J. W. Ullett, works manager, for the facilities and assistance they have kindly afforded us in the preparation of this article.

NOTES.

Gas v. Electricity.—Homerton New Infirmary.—In our "Lighting Notes" some time ago we referred to the decision of the City of London Board of Guardians in favour of electricity. The following fuller particulars will be of interest. The Amalgamation (Bow and Homerton) Committee, which recommended electricity in preference to gas, reported that an estimate and other details had been presented by Mr. A. E. Pridmore, the architect, who had obtained figures from Mr. L. L. Robinson, electrical engineer to the borough of Hackney, as regards electric lighting, and from the Gas Light and Coke Co. relative to gas lighting. The estimated cost of the electricity scheme was stated to be about £1,000, which included everything ready for use, while the Gas Light and Coke Co. offered to equip the Institution with incandescent gas for £289 7s. 9d., that was, charging for the fittings only. Under the electricity scheme there would be about 662 points and a total candle-power of about 13,000, made up by about 350 30-C.P. Osram lamps, 74 16 C.P. carbon filament lamps, and 160 8-C.P. carbon filament lamps; there were also included 100 wall plugs to take hand lamps for the use of the doctor in examining patients if required. The candle-power provided for in the gas scheme was about 30,000 (the number of points being about 500), made up by about 367 "C" Bray burners of 60-C.P. each, and 45 2-light "Humphrey" lamps of 180-C.P. each. It was mentioned that under the electric scheme there were a number of small C.P. lamps which would be in the stores, &c., where but little light was required. According to the Hackney electrical engineer, the annual cost of electricity would be amply covered by £150, and he based his figures on actual experience of similar institutions in the district. The Gas Light and Coke Co. gave an annual cost of £283 16s. 8d., basing the figures on the assumption that the average lighting hours would be three per day, approximately 1,000 hours per annum, with an hourly consumption of 2,000 cub. ft., the total being 2,000,000 cb. ft. per annum, which, at 2s. 10d. per 1,000, would cost the amount mentioned. In regard to the annual cost of maintenance, Mr. Robinson said that an allowance of ½d. per unit was usually sufficient, but owing to the large number of Osram lamps the cost might be more. At ½d. per unit the cost worked out at £40, or at ¾d. per unit the cost worked out at £60 per year. The Gas Light and Coke Co. would maintain at a cost of £82 15s. 0d. per annum. The comparative costs of electricity and gas were set out as follows:—Initial cost per candle-power: electricity, 1s. 6½d.; gas, 2½d.; annual cost of illumination: electricity, 2¾d., gas, 2½d.; annual cost of maintenance: electricity, 1d.; gas, ½d. The total cost of electricity was given as £210 (the annual cost of maintenance being reckoned at £60), as compared with the annual cost of gas amounting to £366 11s. 8d. It was pointed out that the total candle-power given for the gas scheme was more than double that of the electricity scheme, but that the latter had a greater variation in the illuminating power of the lamps, and that one 8-C.P. lamp would be used in a position only requiring a small light, whereas in the same position a gas lamp would be using a 60-C.P. illuminant. The Osram electric lamp gave a candle-power of 30 as against the Bray gas lamp giving 60 C.P. The schemes only referred to the new buildings and the altered part of the old buildings, not taking into account those parts of the institution not being altered, which are at present lighted by gas. Electric lifts were to be provided in any case, necessitating the bringing-in of an electric cable, which the Hackney Council would not do free of charge for this item alone. There was also the fact, it was observed, that it might be considered advisable to have electric power for the laundry machinery, although this did not directly concern the question of lighting the buildings. The Amalgamation Committee recommended that electricity be adopted, and that the architect proceed to obtain tenders.

Electrical Progress in Germany.—Reporting to the Board of Trade on the trade of the Consular District of Berlin, Mr. Consul-General Schwaliach states that the year 1907 witnessed a considerable growth in the business of the electro-technical industry, and the financial results of the electric companies proved very satisfactory also. The continued rise in the scale of wages and the price of raw and auxiliary materials was indeed unpleasantly noticeable, but cautious purchasing prevented the increase in price from being too keenly felt, and also weakened the effect of the sudden fall in the price of copper. The companies sought to check the growing demands of the workmen by replacing manual labour as far as possible by automatic machines. This endeavour accounted for the remarkable circumstance that the General Electric Co. in Berlin, Germany's greatest electric concern, in spite of an increased business reduced the number

of their employés in 1907 from 33,906 to 30,667. The scarcity in the money market did not affect the electric companies to any appreciable extent. A useful lesson had been learned from the crisis of 1900-2, and hence the financial power was strengthened as far as possible, and above all, funds were kept available. In the construction of electric engines, special progress was made. It had at last been proved that the turbine was decidedly superior to reciprocating engines for all heavy work, and the great economy of expense and labour obtained by the work of turbines had opened up ever-increasing fields of operation for the German industries. Alternating-current turbo-generators were mostly in demand, more especially the 1,000-KW. size. Turbines were almost exclusively used in power stations for supplying electrical energy. There was likewise an increased application of electrically-driven reversible rolling mills. Although these machines had only been in use for a short period, German works had already been able to construct 12 electric rolling mills, of a maximum capacity of 12,000 to 15,000 H.P. Of the 12 above-mentioned rolling mills, three were for Austria-Hungary, one for England (wire works in Middlesbrough), one for Switzerland and one for Belgium, the others being erected in Germany. In the electric railway department, the German electric works were very active. In the first place, Berlin and Hamburg gave them continuous occupation in the further extension of their elevated and underground railways. The Prussian State, which introduced electricity for the Hamburg suburban traffic, also became a customer. Bavaria, too, decided to apply electricity as a motive power for rail-road traction on the Berchtesgarden-Salzburg line. Undoubtedly electric railways would be extensively used in the near future, and a great field of work lay open to the electric companies. The next undertaking would probably be the electrification of the Berlin Metropolitan Railway. But it might safely be predicted that the next advance would be the impressing of Germany's water-power into the service of the electrical industry. The number of power stations for supplying electrical energy over great distances would be increased by this means. The different States were evidently alive to the advantage of utilising streams and waterfalls, and were determined to secure these for the public benefit, so as to prevent their monopolisation by private concerns. Considering the great and steadily increasing influence of the electrical industry on economic life in Germany, it was no wonder that there had been some talk of monopolising the production of electrical energy for the Empire; hitherto, however, no definite scheme had been formulated. In conclusion, it should be remarked that the German electrical industry had succeeded in introducing a new insulating material called "Tenacite," an approved and cheap substitute for india-rubber.

Electric Cabs in Berlin.—The work of the Electromobile Cab Co., of Berlin, in 1907, extended over a period of only nine months owing to a strike of drivers, and the accounts show a loss of £9,483, thus increasing the debit balance to £12,654, on a share capital of £150,000. It is stated in the directors' report that the working expenses were substantially reduced during the year, the diminution in the case of the maintenance of tires having alone been 27 per cent. It is intended this year to lessen the number of private carriages and convert them into cabs. The current year will allow of the utilisation of the whole of the vehicles, and from the receipts hitherto obtained the directors hope for considerably more favourable results.

The Electrical Contractors' Association (Inc.).—At the annual meeting of this association held recently, Mr. E. C. Wallis, of Leeds, was elected President for the ensuing year. The outgoing President, Mr. A. Rashleigh Phipps, reported that during the past year a considerable amount of interest had been shown throughout the country in the general affairs of the Association. Nearly 100 new firms had applied for, and been elected to, membership. New branches had been formed in Dundee, Aberdeen, Leicester, Birmingham, and Cheltenham. The financial position had been considerably improved, and the Law and Parliamentary Committee had been successful in getting the clauses amended in nearly a dozen Corporation Bills. A large amount of publicity had been given to the doings of the Association by the trade journals. Negotiations had been entered into with the kindred Association for a more intimate connection. He hoped that the ensuing year would be equally fruitful of results, and stated that the Central Board would be shortly considering the question of registration and examination of workmen, and of the formation of other branches throughout the kingdom.

Telephone Mouthpiece Disease.—A "scare" is again in circulation as to the "deadly germs lurking in mouthpieces." A medical man recently wiped a P.O. telephone with a "swab," and inoculated two guinea-pigs with the contents of that implement or instrument. The guinea-pigs died 23 and 27 days respectively after inoculation. We note with interest, however, that they were *killed*—they did not die of T.M. disease—and it was only by post-mortem examination that "pronounced signs" of tuberculosis were discovered. Six instruments were tested, and only one of them showed any trace of disease germs. We respectfully suggest that as a control experiment a few guinea-pigs be killed *before* inoculating them with the T.M. virus. Ten to one they will show similar signs of disease. It is true that if the general public were in the habit of inoculating itself with or otherwise absorbing into its system, the scrapings from mouthpieces, it would undoubtedly be in danger of infection with diseases many and various; a good plan in such a case would be to stop the process of inoculation or absorption, which can hardly serve a useful purpose anyhow. But we feel confident that the cushions of a single railway carriage (third-class smoker in particular) are infinitely more efficient in the dissemination of disease than all the telephones in London.

Radiodermatitis.—In the *Archives d'Electricité Médicale*, of June 25th, Mr. A. E. Dean gives particulars of more than 20 cases of injury due to X-ray work in England; seven cases have been severe, but only one death has occurred from this cause. It has, however, frequently been necessary to perform operations on fingers, hands and arms. One of the most unfortunate features of the malady is the persistent and acute pain by which it is accompanied, and which depresses the general health, reducing a big strong man to a thin and feeble bundle of nerves. In this connection we may add that on Sunday last Dr. Hall Edwards underwent a further operation, this time on his right hand; we regret to learn from our French contemporary that the disease in his case is malignant, but we trust that the drastic steps taken to remove it may be wholly successful. It is hoped that he may now obtain some relief from the agonising pains which have tormented him for weeks past.

Institution and Lecture Notes.—INSTITUTION OF ELECTRICAL ENGINEERS.—On Tuesday last the special meeting called to authorise the Council to purchase the Medical Examination Hall on the Embankment was duly held. Some 200 members were present, and the building was inspected before the meeting with much interest.

Col. Crompton, the President, occupied the chair, and opened the proceedings by calling upon the hon. treasurer, Mr. Robt. Hammond, to make a statement on the financial aspect of the proposed purchase. From this we gather that in addition to the purchase price of £50,000, it is estimated that a sum of £6,000 will be necessary to provide for the enlargement of the theatre, six months' rent of the existing premises, removal, renovation and furniture. The net sum available from trustee investments is estimated at £19,000, which will be increased by June 1st, 1909, in the ordinary course to £23,000. The book value of the Tothill Street site is £19,260 (though it is expected to realise, perhaps, £5,000 more), and the amount to be raised on loan is £16,000, making a total of £58,260. The income for 1909, including £650 rental from part of the building already let, is estimated at £13,109; and it is anticipated that a considerable sum will be derived from the letting of a further portion of the upper floors. The annual expenditure in the new building, based upon past experience, is £12,953, this sum including £2,201 for ground rent, £1,670 for rates and taxes, and £200 for amortisation. Interest on the loan calls for a further sum of £640, and until the Tothill Street site is sold there will be an additional liability for interest of £150, making a total annual outlay of £13,743. Thus a deficit of £634 is anticipated, but this will be converted into a surplus by the letting of the spare space.

Col. Crompton then moved the resolution authorising the purchase of the building, and the realisation of investments for the purpose. Mr. W. M. Mordey, president-elect, and chairman of the Building Committee, seconded the motion, and referred to the indebtedness of the Institution to the Institution of Civil Engineers, to which alone of the great engineering societies the I.E.E. was second in numbers and importance. He justified the purchase of the Tothill Street site, though it was found unsuitable for the purposes of the Institution (mainly because of "ancient lights," according to later statements), and remarked that the present scheme had not been "rushed," but it had been necessary to act quickly, an option having been obtained for three weeks only, in competition with an important public body. The report from the architect was entirely satisfactory; the average upkeep for 20 years had cost only £170 a year, and £50 would put the building in a sound condition. The question of joining with other societies in an engineering building had frequently been pressed upon them, but their repeated efforts to open negotiations had led to no definite result. The members would not be asked for an increased subscription. The spare space could probably be let for £5,000.

Sir Joseph Swan expressed his cordial approval of the scheme, and said that the Council was unanimous. Mr. G. G. Ward, local hon. secretary, New York, and Mr. E. G. C. Barton, local hon. secretary for Queensland, also welcomed the proposal, but Major Cardew objected to hasty action, and pointed out that while the membership was over 6,000, the motion was to be passed by but 200 members. The building, he thought, was far too big, and the annual outlay on it would be much greater than was estimated.

Mr. Martin Roberts moved that the scheme be referred back to the Council (*i.e.*, rejected), as the building was, in his opinion, particularly unsuitable for the requirements of the Institution, and would prove a white elephant, while it was undesirable to share it with others. Mr. W. B. Esson seconded the amendment, suggesting a few years' delay, as they could easily hire a theatre if necessary, and could get office accommodation cheaply. Mr. Leon Gaster referred to American experience; Mr. Sidney Sharp advocated delay, to accumulate more capital; Major Erskine criticised Mr. Hammond's estimate of expenditure, forecasting much larger outlay, both on alterations and on annual upkeep.

Mr. Alex. Siemens then spoke in support of the scheme, for which he was largely responsible, and dealt with the objections raised. There was no hope, he said, of obtaining a site in Westminster. The expenditure would be less than the income, and he strongly urged the members to support the Council. Mr. Mark Robinson also advocated the purchase, remarking that some of them had been waiting 16 years (since the formation of the building fund), and were getting on in years.

Several questions were asked, and were answered by Mr. Ham-

mond, and Colonel Crompton, who explained the necessity of maintaining silence until they were ready to act. Exactly the same experience, he said, was met with when the Institution of Civil Engineers acquired the site of their present building. The leaders of Local Sections were all in favour of the acquisition of a home for the Institution, and the Council had taken all possible steps to acertain the general feeling before moving in the matter.

The amendment was then put to the meeting, and negatived by a large majority; afterwards the resolution was passed *nemine contradicente*, amid applause, and the business was concluded.

We understand that the building will not be transferred to the Institution until June next year.

The Annual Conversazione of the Institution was held as usual at the Natural History Museum, South Kensington, on Thursday last week. The President, Col Crompton, and Mrs. Crompton received the guests, who numbered some 1,700; the string band of the Royal Engineers performed a programme of music in the Central Hall, and the Alexandra Ladies' Quartette with their songs delighted the visitors of the Diplodocus and Triceratops in the Reptilia Gallery. Amongst the guests were Lord Collins, the Rt. Hon. Sir R. Vaughan Williams, Sir A. Carmichael Bruce, General Sir C. W. H. Douglas, Sir George S. Gibb, Sir W. J. Howell, Sir Joseph Swan, the Hon. Sir R. J. Parker, Col. C. T. Bingham, Col. E. T. Clifford, Col. J. C. Oughterson, Major J. Stewart, Capt. the Hon. F. Hemphill, Prof. H. L. Callendar, Prof. W. A. Tilden, the Hon. W. M. Bruce, Dr. E. Divers, Dr. H. S. Hele-Shaw, Dr. Alex. Scott, Dr. G. J. Stoney, Mr. J. Ardron, Mr. W. G. Cavendish Bentinck, Mr. E. Cunliffe-Owen, Mr. J. Hunter Gray, Mr. A. J. Walker, Mr. and Mrs. I. Zangwill, and many distinguished members of the Institution, including the President elect, Mr. W. M. Mordey. The occasion was marked by the usual success, and nothing occurred to mar the enjoyment of the guests.

The I.E.E. students will leave St. Pancras for Derby on Monday next at 10.6 a.m., not 9.30, as previously stated. Tickets must be obtained from Messrs. Cook, Ludgate Circus, before Monday.

LIVERPOOL AND DISTRICT ELECTRICAL ASSOCIATION.—On Saturday, June 27th, a party of members and friends paid a visit to the Pacific Steam Navigation Co.'s ss. *Orita* in the Alexandra Dock, Bootle. The visitors were received by the officer on watch, when a complete survey was made of the steamer and its equipment, and a detailed inspection was made of the engine room plant, under the guidance of the steamer's electrician. The next meeting of the Association, which will be the annual general meeting, will be held at the Common Hall, Hackins Hey, Dale Street, at 8 p.m. on Tuesday, July 21st, when the re-election of the officers and council will take place.

SOCIETY OF ENGINEERS.—By permission of the director, the members of the Society of Engineers paid a visit to the National Physical Laboratory, Teddington, on Saturday last.

INSTITUTE OF METALS.—On the 10th ult. the new Institute was formally brought into existence, at the Institution of Mechanical Engineers. Sir Wm. White, who opened the proceedings, was elected the first President, and an interim council was formed, with Prof. C. H. Carpenter and Mr. W. H. Johnson as joint hon. secretaries. Steps are being taken to appoint officers and draw up a constitution.

Geo. Kent, Ltd., Luton.—On June 30th, the new works of Messrs. Geo. Kent, Ltd., of High Holborn, were formally opened at Luton, when a large gathering of engineers were present at the inspection and inaugural luncheon. Messrs. Kent have been induced to make this move by reason of the extension of their business, particularly in the direction of water meters, of which they make several varieties, including the Venturi meter. The various difficulties connected with the running of an engineering works in London have no doubt had their share in bringing about the change. So far, only the hydraulic work is being moved, and the tools are being transferred to Luton as quickly as the pressure of business will allow, but ultimately other departments will probably follow, and provision has been made so that the shops already constructed can be carried further on the present lines by the simple expedient of adding to one side of the buildings from time to time such additional bays as may be necessary.

All the various workshops are on one level so as to facilitate the handling of material; the machine shop is built with a saw-tooth or weaving-shed roof with north lighting, and the foundry is very well lighted, both by windows of large size in the walls and by roof lights. The foundry is the most advanced portion of the new works, and casting was in progress during the inspection. The buildings include a large machine and fitting shop, iron foundry, brass foundry, pattern shop, packing-case shop, testing room, men's clubroom, sand store, a well arranged lavatory with shower baths, and various smaller buildings, rooms and offices. The new works lie close alongside the Midland Railway, and at present occupy a rectangle of 768 ft. × 230 ft., and the capacity is 400 water-meters per week. The driving of the works is done electrically, current at 500 volts being supplied from the Luton Corporation electricity works.

There were present at the luncheon the Mayor of Luton and Mr. Alderman Warren, and from the speech of the latter gentleman, the assembled company learned much of the advantages of Luton as a town for the establishment of works. What with its excellent sanitation, its pure water and plentiful and cheap gas, its extraordinarily good air and the overflowing hearts of its inhabitants, we came away almost persuaded that here must have been the Garden of Eden. Something may be excused to Alderman Warren, who appears to have been largely responsible for the entrance into the town of these works and those who suffer from the ill-considered and peevish actions of the authorities in larger towns than Luton will, we fear, only too readily flee to less heavily rated towns like Luton, where, to use Mr. Kent's words, a workshop is regarded as something other than merely a staircase in a field, which seems to be the ideal of the more grandmotherly municipalities.

The buildings are of brick, and the whole of the steel work of the roofs, gantrys, stanchions, &c., was the work of Messrs. Francis Morton, Jun., & Co., of 110, Cannon Street. It is obvious that with these country towns competing for the establishment of industries within their borders, the burden of rates in London runs no inconsiderable risk of increase. Indeed, what London loses, the small towns are gaining.

Tungsten Lamp Patents: Application for Amendment.—In the *Illustrated Official Journal (Patents)* for June 17th there appear lengthy notices of applications made by the Wolfram (Tungsten) Metal Filament Lamps, Ltd., for leave to amend the following patents:—

No. 23,899, of 1904, granted to Alexander Just and Franz Hanaman for "Improvements relating to the manufacture of incandescent lamps."

No. 11,949, of 1905, for "Improvements in and relating to the manufacture of incandescing filaments for electric incandescent lamps."

No. 20,175A, of 1905, for "Improvements relating to the manufacture of incandescing bodies for electric incandescent lamps."

No. 3,225, of 1906, for "Improvements in and relating to the manufacture of incandescing bodies for electric incandescent lamps."

No. 3,684, of 1906, for "Improvements in and relating to the manufacture of incandescing bodies for electric incandescent lamps."

No. 4,081, of 1906, for "Improvements in and relating to the manufacture of incandescing bodies for electric incandescent lamps."

In all cases the reasons given are that part of the invention described in the specification is of doubtful novelty, and that accordingly the claims relating thereto are of doubtful validity. One of the principal amendments appearing in the list set out in the *Journal* is the striking out of the word "molybdenum."

"Cheap Electric Light."—Quite a sensation was got up in the daily Press last week on the strength of interviews with Mr. Duncan Watson, who expounded to the reporters the transformer system of installing metallic-filament lamps to burn at 25 volts. In the opinion of Mr. Watson, we are told, this new departure will revolutionise the electric lighting business. But Mr. Watson was not allowed to have things all his own way, for on Friday last the *Daily Mail*, no doubt on information received, pointed out that the ingenious invention for enabling householders to save 70 per cent. on their electric light bills was devised by a M. Weissmann, who "discovered" a method of transforming the ordinary voltage of 110 or 220 down to 22 volts. Truly we live in an age of progress and *invention*, and wonders never cease in the daily Press. No less wonderful are the methods adopted for pushing business nowadays.

Municipal Trading at Southport.—Municipal trading is strongly criticised by Mr. S. Hardman, elective auditor, in his annual report on the finances of Southport. "I have not hesitated," he says, "to call attention to what, I believe, is an unsound system of taxation—charging monopoly prices for electricity, water, gas and other services, and applying so-called profits in relief of rates." He goes on to urge that the price of electricity and gas to the consumer should be reduced to the net cost. Dealing with the electricity works, he says:—The profits shown are the result of the high price charged for electricity—viz., 4½ per unit at a flat rate. I also found that as high a price as 2d. per unit is charged for power to the Southport Tramways Co. A friend of mine, a large consumer, mentioned to me the other day that he held a contract with the Manchester Corporation at five-eighths of a penny per unit.

As to the Southport tramway undertaking, he reports:—Owing to the excessive charges and onerous agreements made with the two municipalities, I find the tramway company have only a net revenue of £720 on a capital of £86,000. Out of a gross revenue of £16,000, no less than £9,000 per year is paid for rent, rates, charges and power. We cannot expect private enterprise to embark on ventures in Southport when the results are so unremunerative, and when they are so heavily handicapped by municipal charges.

Fire.—A fire occurred in the electrician's room at the Savoy Theatre last Saturday night, but the necessary repairs were speedily effected, so that by Monday night the *Mikado* was performed as usual.

A New High Resistance.—The construction of an accurate and permanent resistance of the order of 100,000 megohms is a matter of some difficulty. The materials hitherto in use have consisted of fine carbon threads on ebonite or ground glass, or a liquid of high resistance, such as amyl alcohol or xylene. In the case of carbon, practically the entire resistance is concentrated at one point, and is due merely to a bad contact, which is, of course, very uncertain, and subject to all kinds of external influences. Liquid resistances on the other hand have a very large temperature coefficient. In both classes there is necessarily present a considerable amount of dielectric material, and the absorption due to this is a function of both time and temperature. In a recent paper communicated to the American Electrochemical Society, H. L. Bronson shows that he has overcome the difficulty in a very ingenious manner. It is well known that radium, amongst its other properties, has the power of ionising gases and rendering them more or less

conductive to electricity. This property is, in fact, used as a basis of evaluation of the strength of radium bromide samples. The principle involved is simple. The rule states that the ionisation current through a gas subject to a constant source of ionisation is approximately proportional to the potential difference between the plates when this difference is small. The author has constructed resistance vessels, the inside dimensions of which are 2·5 by 1·5 cm. The electrodes are composed of aluminium, and the active material consists of 0·1 milligram of radium bromide. It is generally possible to adjust the distance between the plates so that a linear relation exists for a considerable range of potential. From the results given in the paper it seems possible that standard vessels of this type might be constructed and preserved as permanent high-resistance standards. These should be found useful for insulator tests or any other high-resistance measurements. No special gas is required in the containing vessels, the results being apparently unaffected by the nature and constitution of the ionised particles.

Hydro-Electric Plant for Tokio, Japan.—The first 60,000-volt hydro-electric plant in Japan has just been put into service, after having passed the rigid inspection which is required by the Japanese Government of all electrical installations. Power is obtained by impounding the Ugigawa, a narrow and swift but deep river, such as is often found in the mountainous portions of Japan. The normal rating of the main station, which is 18,000 KW., is furnished by six 3,000-KW., 50-cycle, 6,600-volt water-turbine-driven alternators. The generator voltage is stepped up through three banks of three single-phase, water-cooled 2,000-KW. transformers, to the line pressure of 60,000 volts, at which pressure energy is transmitted 25 miles to the Waseda sub-station just outside the city of Tokio. In this main sub-station water-cooled 1,800-KW. transformers reduce the voltage to 11,000 volts, at which pressure energy is transmitted underground through armoured cables to 11 distributing sub-stations situated in various parts of the city. In each of these smaller sub-stations oil-cooled transformers of 250-KW. rating reduce the voltage to 2,000 volts, the line pressure of the city circuits. The territory immediately surrounding the Waseda sub-station is also fed with energy at low voltage for lamps and motors. The transformer, regulating and control equipment, and the cables were furnished by the General Electric Co.—*Electrical World.*

The London Electric Supply Bills.—Lord Cromer's Committee on Wednesday continued the consideration of clauses in the London (Westminster and Kensington) Electric Supply Companies Bill, and ordered the Bill to be reported to the House.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—On Thursday last week MR. ALFRED J. HASTINGS, mains superintendent in the Yarmouth Corporation Electricity Department, was married to Miss Lucy S. Lucock. The presents included a liqueur stand from the mains and wiring department, and a silver sugar-bowl from the chief and assistant engineers.

At the offices of the City of Birmingham Electric Supply Department on Thursday evening, June 25th, MR. W. Y. ANDERSON, a member of the staff, was presented with a marble clock, two bronzes and a dessert dish, towards the cost of which every member of the staff subscribed, in commemoration of his marriage on June 29th. The presentation was made by the city electrical engineer and manager, Mr. R. A. Chattock.

A complimentary dinner was given at the Queen's Hotel, Ilfracombe, to MR. A. ALAN JENKINS, the resident engineer and manager of the local electric light and power company, who is shortly leaving the town.

The Derby T.C. has appointed MR. J. HEBB, as canvassing engineer.

MR. CHAS. UDALL has been appointed chief engineer and manager to the Nairobi Electric Power Co., and will sail for East Africa; his month.

MR. J. H. THOMPSON, A.M.I.E.E., of Burton-on-Trent, has been appointed station superintendent at the Carlisle Corporation electricity works.

On the occasion of his marriage, MR. JAMES SLEVIN, borough electrical engineer at Wigan, has been presented by the electricity and tramway staffs with a tray and service of silver.

MR. W. T. MACCALL, of the Woolwich Polytechnic, has been appointed head of the Electrical Engineering Department at the Halifax Municipal Technical School, at a salary of £200 per annum.

Tramway Officials.—MR. W. SMITH, manager of the Taunton tramways under the British Electric Traction Co., has been appointed manager at Peterborough, and MR. AYLIFFE, foreman at Taunton, succeeds to his position.

General.—The Sussex district staff of the National Telephone Co. has presented a tea and coffee service to MR. F. W. TAYLOR, late manager, who proceeds to Manchester. Mr. Taylor is succeeded at Brighton by MR. MOORHOUSE, formerly contract manager there.

DR. E. RUTHERFORD, F.R.S., of Manchester University, has been appointed a corresponding member of the Physico-Medical Society of Vienna.

MR. MULES BROWN, F.C.I.S., has resigned the secretaryship of the Electric and Ordnance Accessories Co., Ltd., Stellite Works, Aston, and has returned to his offices in London at 1, Lancaster Place, Strand, W.C.

CAPT. GEORGE ROLLO, after many years' service, has just resigned his commission in the West Lancashire Telegraph Engineers, which until recently was known as the Mersey Division Electrical Engineers.

MR. E. CHETWYND JONES has resigned his position of assistant engineer, Electric Light Department, Sydney, to take up duties as electrical engineer to the Chillagoe Railway and Mining Co., North Queensland.

It is announced in yesterday's *Times* that the Postmaster-General has appointed Lieut. F. G. Loring, R.N., as inspector of Wireless Telegraphy at the G.P.O.

In the King's Birthday Honours issued last week, there are no honours conferred upon electrical engineers. We, however, tender our hearty congratulations to Mr. R. W. Perks, M.P., who is made a Baronet; to Mr. R. A. Hadfield, of Sheffield, who becomes a Knight; and to Mr. H. Babington Smith, C.B., secretary of the Post Office, and Mr. H. Llewellyn Smith, C.B., of the Board of Trade, both of whom are promoted to be K.C.B.'s.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Electrolytic Alkali Co., Ltd. (Middlewich) (64,360).—Issue on May 23rd of £500, and on May 25th of £100 4½ per cent. debentures, part of series created July 9th, 1904, to secure £50,000, charged on the company's undertaking and property, including uncalled capital. Trustees: Liverpool Mortgage Insurance Co., Ltd., 6, Castle Street, Liverpool. Previously issued of same series: £36,900.

Buenos Ayres Electric Tramways Co. (1901), Ltd. (71,206).—An acknowledgement of indebtedness under seal, dated May 27th, 1908 (supplemental to a trust deed dated March 30th, 1906, and acknowledgement of indebtedness dated March 7th, 1907), to secure a further £20,000 second or "B" debentures, making, with £51,600 already created, a total of £71,600, out of a total authorised sum of £100,000, has been registered. Property charged: Certain tramway concessions, freehold land, rights and the company's undertaking and property, present and future, including uncalled capital. Trustees: W. Greenwell, 2, Finch Lane, E.C.; and F. C. Tearks, 145, Leadenhall Street, E.C.

Cowans, Ltd. (57,378).—Particulars of £3,000 debentures, created by resolution of May 29th, 1908, have been filed pursuant to Sec. 14 (4) of the Companies' Act, 1900. Property charged, the company's assets, present and future, including uncalled capital. No trustees.

Sunderland District Electric Tramways, Ltd. (79,054).—A trust deed, dated May 29th, 1908, to secure £20,000 5 per cent. prior lien debentures, has been registered. Property charged: Benefit of the Houghton-le-Spring and District Tramway Order, 1900; tramways, fixed machinery and plant; two acres of freehold land at Newbottle, Durham; and the company's undertaking and other assets, including uncalled capital. Trustees: C. S. Cockburn, Sutton Rock, Chesterfield; and C. Eves, Capel House, 54, New Broad Street, E.C.

Bath Electric Tramways, Ltd. (74,278).—This company's annual return was filed on May 22nd, when 75,000 preference, 75,606 preferred ordinary and 30,000 deferred ordinary had been taken up out of a nominal capital of £230,000 in 75,000 preference, 125,000 preferred ordinary and 30,000 deferred ordinary shares of £1 each; £1 per share has been called up on 75,000 preferred and 75,606 preferred ordinary, and £150,606 has been received; 30,000 deferred ordinary shares are considered as fully paid. Mortgages and charges: £166,000.

Anglo-Argentine Tramways Co., Ltd. (25,363).—A trust deed, dated June 2nd, 1908, to secure £565,000 4 per cent. debenture stock, with power to issue further debenture stock, ranking *pari passu* therewith (limited to such a sum as will not require more than £180,000 to be provided for interest thereon, and an annual payment to a sinking fund sufficient for its redemption upon the basis prescribed in the trust deed on January 30th, 1908), has been registered. Property charged: The company's undertaking and property, present and future, including uncalled capital, subject to prior indentures securing £266,600 6 per cent. debenture stock. Trustees: Law Debenture Corporation, Ltd., 41, Threadneedle Street, E.C.

Bournemouth and Poole Electricity Supply Co., Ltd. (55,189).—Particulars of a series of debentures for securing an amount not exceeding half the subscribed capital for the time being (present subscribed capital being £975,000), created by resolutions of March 5th, 1900, July 16th, 1903, and May 21st, 1908, have been filed pursuant to Sec. 14 (4) of the Companies' Act, 1900. Property charged: The company's undertaking and property, present and future. No trustees.

Roundhay and District Electric Lighting Co., Ltd. (66,293).—This company's annual return was filed on May 20th, when 789 ordinary and 225 preference shares had been taken up out of a nominal capital of £20,000 in 1,200 ordinary and 800 preference shares of £10 each. £10 per share has been called up on the ordinary and £4 per share on the preference, resulting in the receipt of £8,690. £100 remains in arrears. Mortgages and charges: Nil.

Hayward's Heath Electric Supply Co., Ltd. (81,403).—This company's annual return, made up to January 14th, was filed on June 11th. Seven shares have been taken up out of a nominal capital of £1,000 in £1 shares. No calls have been made. Mortgages and charges: Nil.

Gloucestershire Electric Power Syndicate, Ltd. (73,184).—This company's annual return, made up to December 31st, 1907, was filed on May 16th, 1908. 31 ordinary and 424 deferred shares have been taken up out of a nominal capital of £7,530 in 75 ordinary shares of £100 each and 600 deferred shares of 1s. each. £3,121 4s. has been received. Mortgages and charges, £850.

Madras Electric Tramways (1904), Ltd. (80,361).—This mpany's annual return was filed on April 10th, when 15,000 preferred ordinary and 11,452 deferred ordinary shares had been taken up out of a nominal capital of £150,000 in 15,000 preferred ordinary and 15,000 deferred ordinary shares of £5 each. £5 per share has been called up on 5,000 preferred ordinary shares, resulting in the receipt of £25,000. £39,760 is considered as paid on 17,952 shares. Mortgages and charges: £81,800. (Capital increased from £100,000 to £150,000 in June, 1907).

CITY NOTES.

The Johnson-Lundell Electric Traction Co.

A formal meeting of this company was held in the Cannon Street Hotel on June 30th, at which no business was transacted, the meeting being merely convened to comply with the requirements of the Companies' Act. Since the last meeting of the shareholders the position of the company does not appear to have improved. The original split-pole Lundell dynamo seems to have been almost forgotten, and occupies a secondary position in the proceedings of the company, the system of regenerative control being now regarded as the most important asset. Either the electrical world is not ready for regenerative control, or the system has not been exploited in the right way, if we are to judge by results. The present proposals of the company are to sell the works which were put up for experimental purposes, and the remaining funds of the company are to serve for keeping alive the patents until a more favourable opportunity occurs. In view of the many serious accidents which have been recorded recently in connection with electric tramway work, one might have thought that the present time offered as favourable an opportunity of pushing the claims of regenerative control for tramway work as is ever likely to occur in the future.

Another meeting will be held in a few weeks' time to hear the views of the board more fully, and to receive an account of the terms of settlement which have been arranged with Messrs. J. H. Holmes & Co., the principal promoters of this unfortunate concern.

From the statement of accounts presented, there appears to be a loss on the year's working of £14,269, bringing the loss up to date to £55,854. The assets include an item of £13,134 for "motors and other equipments for experimental work, &c.," an amount which the auditors say is "very largely in excess of the value of the assets represented thereby."

Globe Telegraph and Trust Co., Ltd.

The Marquess of Tweeddale, K.T., presided on Tuesday over the ordinary general meeting held at Electra House. In moving the adoption of the report, he said it would be a little misleading to compare the actual receipts of the year with those of last year, because, as he explained on the last occasion, their accounts for that period covered 13 months, which was caused by the alteration which the Eastern Extension and Eastern Telegraph Co. made in making up their accounts. Their receipts for the year, after deducting expenses, amounted to £210,295. The directors recommended the payment of a final dividend of 5s. 9d. per share on the ordinary shares, making, with previous distributions, a dividend on those shares of 5¾ per cent.—the largest distribution made in any year on that class of shares. Those dividends would absorb the sum of £77,884, and that left a balance of £27,206 to be carried forward to the next account. Dealing with the details of the accounts, they would see that the companies in which they held an interest, showed an improvement, whilst in one case there was a diminution. The Anglo-American Co.'s receipts compared, on the face of them, very unfavourably with the corresponding period, and that was accounted for by the fact that in their last accounts five quarters were included. As regarded the Central and South American Telegraph Co., they had received 912 bonus shares, which had increased their income with that holding by over £1,000. That was very satisfactory, as they had a considerable holding. The receipts of the Commercial Co. showed a small increase—£72, as against £60 last year, consequent upon their dividend being 6 per cent., as against 5 per cent. last year. The Eastern Telegraph Co. and the Eastern Extension Co. had paid their usual dividend. As to the Telegraph Construction and Maintenance Co, that company, he was glad to say, had paid an increased dividend of 17 per cent. as against 15 per cent., which had increased their receipts by £1,000. Turning to the Western Union Telegraph, he had to report a decrease in the dividend received from that company, but that was not surprising when they remembered the recent crisis through which America had passed. Their total investments now showed an increase on their original value when bought, of £280,000.

Sir James Pender seconded the motion, and the report was adopted.

New General Traction Co., Ltd.

The directors' report for the year ended March 31st, 1908, showed a revenue received and accrued from the various sub-companies, amounting to £18,893, against £14,768 in the previous year. The general expenses amounted to £2,509, as against £2,483 in 1907. The amount paid for debenture interest was the same as for the previous year, viz., £13,200, before deducting income-tax thereon, as had formerly been done. The item of "interest on loans, discount and commission," figured as £3,293, against £1,836. The accounts for the year show a small profit of £264, thus reducing the balance of loss previously shown to £26,520. The Coventry system has shown satisfactory results, enabling that company, besides paying an increased dividend, to reduce its indebtedness to this company by £4,000. The Norwich Tramway traffic returns are disappointing. The returns from the Douglas property have again been satisfactory. The Philadelphia undertaking is complying regularly with the provisions of the agreement mentioned in last year's report.

The ordinary general meeting was held on Tuesday at 20, Bishopsgate Street Within, Baron Emile B. d'Erlanger presiding.

The Chairman, in moving the adoption of the report, said that the changes in the accounts were absolutely insignificant. The only point to which he wished to call attention was that there had been an increase of about £4,000 in their receipts from the securities which they had invested in subsidiary companies—namely, £18,892 compared with £14,768 last year. Apart from that they had made a profit of £913 in the way of commission on a new contract at Coventry. The balance-sheet showed a slight balance to the good as compared with last year. There had been £4,000 earned at Coventry, which they had not treated as a profit, but simply as a return of capital. The amount of securities which they held had diminished by about £5,000, the figures being £655,773, as compared with £648,773. That difference was to be attributed to the sale of bonds in the Philadelphia undertaking. They had held them so long because of the American crisis, and had only sold as many as were necessary to provide the funds that they required. Should the American market revert to its former firmness, they intended to pay off the floating debt on the Traction Co., with such bonds as were not pledged to the prior lien debentures, and after that they could be sold to pay off as many as possible of the prior lien debentures, which would begin to rank for redemption in 1910. As he had said on many occasions, they were really a trust company in different undertakings—Coventry, Norwich, Douglas Southern and Philadelphia. The Coventry company had given every satisfaction during the last two years, showing a very large increase in receipts and a very handsome return upon the capital invested. The Norwich Electric Tramway Co. had given them a good deal of anxiety and was very disappointing in its results. Instead of showing any improvement, the company year by year showed a diminution, and all they could do was to trim their sails and cut down expenses in every way possible. The Douglas Southern Co. gave a steady return, and as for the Philadelphia undertaking, in which they had such a large sum of money at stake, it was fulfilling all its obligations under the lease. As they knew, that lease provided, first of all, for the payment of interest on the debentures and a small dividend on the shares, rising gradually until a maximum of 5 per cent. was reached in 1911.

Mr. R. J. West seconded the motion, and the report was adopted.

Elmore's German and Austro-Hungarian Metal Co., Ltd.

Mr. John MacFarlan presided on June 24th at Finsbury House, E.C., over the meeting of this company, and, in moving the adoption of the report (see Electrical Review, June 29th, page 1040), he said the directors met the shareholders with greater satisfaction than they did last year. The trade done during the year showed a considerable advance upon anything hitherto attained by the Metal Co., but the extra profit made thereby was swallowed up to a large extent by the unexpected increase in the general expenses, which prevented a substantial decrease in the total cost of production being made. The Metal Co. paid in interest a total of £7,400 during the year, as against £5,787 in 1906. The directors thought it wise to continue depreciating at the same rate as heretofore, and they had also written off M.13,800 on patent account, which brought the total amount written off on account of depreciation to over M. 82,000 for the year, so that the position of the Metal Co. was very stable. During the year considerable increases were made to plant and buildings, which they believed would be instrumental in reducing the cost of production; so far they had been successful, and the cost of production last year showed a marked improvement over that of 1906. During the first quarter of this year, notwithstanding the falling off in trade generally, the sales showed a large increase over those of the first quarter in 1907; this, coupled with certain economies which were being carried out at Schladern, led the directors to believe that the profits from the Metal Co. would further increase. In order that the shareholders might not have to wait for a whole year before obtaining information as to the progress of the Metal Co., the directors proposed sending out a circular in July, giving full particulars of the work done for the half-year ending the 30th inst. The fall in the price of copper had released a certain amount of capital since December 31st, and the financial difficulties which had always been a source of trouble to the company, had, at any rate for the time being, disappeared, notwithstanding the large expenditure which had been made on new plant and buildings. The German auditors did not appear to have quite understood the accounts of the Metal Co., and had ventured the opinion that the assets had in 1906 been over-valued. The directors disputed that opinion. In 1906 the property of the company was valued by independent experts, who valued the land, buildings, water-power and fixed plant (which stood in the books at only M. 1,742,209) at M. 3,396,175, so that those items stood at M. 1,653,966 less in the books than the amount at which the experts valued them. And it must not be forgotten that these experts were appointed by the bankers, who had, after receiving this valuation, made an advance the company. As to the copper, the actual results proved that the stock was, if anything, under-valued. They had on December 31st, 1906, 629 tons, and notwithstanding that a large proportion was

either wholly manufactured, or partly manufactured, it was valued in the books at an average of £81 per ton, while on the same day they paid £110 per ton for raw copper, and on January 2nd, two days afterwards, they had to pay £112 10s. per ton. The fact that they faced the great fall in the price of copper, and yet showed an increased profit of about M. 60,000 on the trading account, was the best possible proof that the copper stock was not over-valued. The German auditors also drew attention to the fact that they had not charged repairs and maintenance of plant to revenue. Going back for the past 10 years, it would be found that they had deducted M. 433,724.00 by way of depreciation, and at the same time had maintained the plant in first-class condition, which was manifest, as the experts valued it at a much higher figure than it stood in the books, and the directors had come to the conclusion that plant should bear its up-keep in the future, as the amount deducted by way of depreciation was ample to cover any sum that was spent in repairs and maintenance. It would be seen, moreover, that depreciation was higher this year by M. 14,280, as it was deemed advisable to reduce the amount standing to the credit of patents. The dividend recommended was not a large one, but it was hoped that it would be the starting point of steady dividends in the future.

Mr. J. Heal seconded the motion, which was carried without discussion.

On the motion of the Chairman, a dividend of 2½ per cent. was ordered to be paid on the preference shares.

Replying to a vote of thanks, the Chairman said the directors had had a long and hard fight, but they hoped that they saw land in sight at last.

British Electric Traction Co., Ltd.

Sir Charles Rivers Wilson presided on Thursday last week at Salisbury House, E.C., over the twelfth ordinary general meeting of the company.

In moving the adoption of the report (see Electrical Review, June 26th, page 1077), the Chairman said the balance-sheet and profit and loss account had been made as simple and clear as it was possible to make them, and the accompanying schedules contained a great deal of detailed information which was not usually published by industrial companies. In the directors' opinion the fall in market value of the company's shares and debentures in the past year was much greater than the circumstances of the company called for, and the directors considered that the best way to remove the unwarranted impression which seemed to prevail to a certain extent that the position of the company was not satisfactory, was to give every possible information concerning not only the affairs of the company, but also of the associated companies in which the company was so largely interested. The figures given in the report would show that although the business done in the past had yielded a moderate reward, yet these undertakings were being worked at less profit than they had every reason to believe would be the case. The subscribed share and debenture capital of the company was £4,949,969. The amount due to creditors was only £12,570, and the debenture interest accrued at the date of the balance-sheet was £46,623; so that apart from the reserve for depreciation and balance at net revenue account, the total of the debit side of the balance-sheet was £5,009,165. To meet this there were assets appearing on the credit side of the balance-sheet amounting to £5,658,653, and of this large amount the intangible items like "expenditure on Acts of Parliament" and other rights and powers which might or might not be realised, and goodwill, represented only £18,528. There was, therefore, a surplus of assets of about £631,000, and the important question for the shareholders was whether the depreciation of securities held by the company was greater or less than the surplus. With regard to this question, the directors could not do more than give the shareholders the fullest information, and each shareholder must form his own opinion. The difficulties of making an accurate valuation of the numerous investments and undertakings held by the company were so great that the directors were unable to attempt it. The fundamental difficulty about making a valuation was to decide upon any general principle upon which the valuation could be made. Several of the undertakings were not yet fully developed, and the circumstances surrounding others were not sufficiently definite to enable an accurate estimation of their value to be made. There could, however, be no doubt that the depreciation of the company's shares and debentures had been exaggerated. The net profit amounted to £203,194, and after deducting the interest on the first and second debentures, and adding the balance of £13,115 brought forward from the previous year, there remained £118,824. After a deal of discussion the directors had decided to recommend that £35,000 should be added to the general reserve, raising this to £602,420; that £35,393 should be carried forward to next account, and that £48,431 should be applied in payment of a dividend on the preference shares of 3 per cent. for the year. They regretted that the dividend was not larger, but they had come to the conclusion that the important thing at the present juncture was to reassure the shareholders that the directors were not paying dividends at the expense of the future stability of the company. They were encouraged to act on this view as the dividend on the preference shares was cumulative, and if, as the result of the policy of the board the profits could be increased, the sacrifice the shareholders were asked to make might be regarded as only temporary. They had over £5,000,000 of assets, and however much it might be said they had depreciated in value, nevertheless the company stood on a firm foundation and had very small liabilities. On March 31st they had £200,000 consols, and since then they had purchased a further £50,000. At the same date they had about £50,000 cash at bankers, and close upon £400,000 in debenture stock connected with companies, besides several million pounds of other securities, and there were very few companies in England which could show an equally strong position. The company would experience no financial difficulty in embarking on fresh enterprises as soon as the directors could satisfy themselves that such enterprises could be entered upon with safety and with a reasonable prospect of making profits. They had been working for about 13 years, and during that time had established a large number of undertakings which had been of great benefit to the community. In the earlier years they were able to make profits on the promotions, and satisfactory, although moderate, dividends were paid on the capital in full expectation that when such promotion profits diminished the profits made on the working of the undertakings would replace them. In this respect they had been a good deal disappointed. The undertakings had been well established and not over-capitalised, but so far they had yielded unsatisfactory profits. The explanation was to be found in a consideration of the environment of these undertakings, which was to a large extent determined by legislative and municipal conditions. There was no doubt that the electrical enterprises of the country had been greatly influenced by political considerations. For 10 years electrical tramways were administered as sound commercial undertakings in America and on the Continent before anything was done in this country, and the reason for the delay was that it was impossible to embark capital under the terms of the original Tramways Act. When the Light Railways Act was passed, it seemed that tramway undertakers would no longer suffer the hardships they had under the Tramways Act, and thereupon their company acquired the control of a large number of more or less derelict horse and steam tramways with a view to converting them to electric traction, and extending them. The immediate result, however, of the company's efforts was to arouse the jealousy of the local authorities who were urged on by an agitation in favour of municipal Socialism, and where the local authority did not enter into business themselves, they thwarted and harrassed private enterprise, with the result that many of the undertakings the company had in hand were broken up into sections, and even these mutilated undertakings were unnecessarily injured. Nor could it be fairly said that the industry had received the protection and encouragement which it might reasonably have expected in official quarters. Adding to this the constant demand on the part of the public for increased facilities and reduced fares, it was not difficult to see why industrial undertakings could not yield adequate returns. Proceeding to deal with the company's investment of £200,000 in the Brush Electrical Engineering Co for which no dividend had been received for two years, the chairman said that while American and Continental manufacturing companies were prosperous and paying dividends of 10 and 15 per cent., there was scarcely an electrical manufacturing company in the country which was earning an adequate profit. One reason was because the economic conditions of the country for some years past were dominated by the general desire for undue cheapness of all commodities and services, and the condition of the electrical industry afforded a good example of what this economic policy was costing the country. When better times came and the disastrous conditions under which business was conducted were removed, or at least alleviated, the Brush Co. would, with its experienced staff, be in a foremost position to take advantage of the fact. He might appear to be speaking in a pessimistic spirit, but still he believed that public opinion was beginning to take a distinct interest in the problem with which they had to deal. He believed that a certain sympathy for their sorely tried industry was growing up. As this change of attitude became more accentuated, he felt that means would yet be found for securing to their industry some measure of that support and encouragement which certainly it deserved, and which had been so unwisely withheld from it in the past.

Mr. Arnold Forster, M.P., seconded the motion, and alluding to the decrease in the dividend, said the board had determined to pursue a constructive policy. There were, however, opportunities for embarking on new schemes, and the board would not be backward in developing the legitimate business of the company.

After some discussion the report was adopted.

J. G. White & Co., Ltd.

The meeting of this company was held on Monday at the offices, 9, Cloak Lane, Cannon Street, Mr. J. G. White presiding.

The Chairman, in proposing the adoption of the report (see Electrical Review, June 26th), referred to another successful year's trading. The difficulties arising from stringencies in the money and securities markets, and the severe competition existing in all branches of trade, had been very great, but, as indicated by the figures now submitted, those difficulties had been satisfactorily met. The cash at bankers and in hand, showed an increase of approximately £9,000, as compared with February 28th, 1907, being over 40 per cent. of the company's total indebtedness, which no doubt they would consider very satisfactory, while on the other hand, the company had no monies borrowed. Investments aggregated a higher total than last year, owing to additional securities having been acquired, but since the date of the balance-sheet this figure had been reduced by sales at a substantial profit of securities valued in the balance-sheet at £24,752. In consequence, the present book value of securities owned was below the figures shown in last year's balance-sheet. After deducting dividends and bonus paid and recommended in the report, amounting to 8 per cent. on

all classes of shares for the year, the company's reserve fund would stand at £80,000, in addition to further accumulated profits carried forward of £16,249. This left the total accumulated profits at £96,249. The directors believed that the investments had been valued on a thoroughly conservative basis. As shareholders doubtless knew, the securities owned by the company were acquired in the ordinary course of its business. Careful attention was given to the development of the properties in which the company was interested, with the general result that the average yield in interest and dividends during the year was equal to 6½ per cent. on the average valuation of the securities owned. This, they would doubtless agree, might be considered entirely satisfactory, especially as some of the securities were likely, under normal conditions, to substantially increase in value. The whole of the securities were unpledged, and would be available for borrowing purposes should the needs of the company at any time require this. If the cash in hand was deducted from the total indebtedness of the company, the remainder was less than one-half of the general accounts and bills receivable, including retentions on work in progress, and these assets receivable, plus investments, would equal nearly four times the remaining indebtedness. Ample provision had been made for depreciation, and the fourth item on the list of assets was conservative, plant and tools appearing at only about 25 per cent. of their cost. The item "Purchase of Business" remained as in former years, but this was less than half the reserve fund and profits carried forward, after providing the year's dividends. Regarding the future, he was pleased to be able to say that the business in hand was sufficient to ensure thoroughly satisfactory profits for the current year, and negotiations for other important business were progressing favourably. After referring to the company's interest in Waring & White (1906), Ltd., the chairman said that the profit and loss account submitted did not include any dividends or other profits from the shares owned in Waring and White (1906), Ltd. If the earnings of the building company had been taken into account, the profits of the company for the year would have been substantially increased, and considerably in excess of last year. With the standing which the building company had earned for itself, their company's interest in it should during future years be a source of substantial income.

Mr. J. B. White seconded the motion, and the report was adopted.

Buenos Ayres Grand National Tramways Co., Ltd.

Sir Irving Courtenay presided last Friday at the annual meeting held at Winchester House, and in moving the adoption of the report (see Electrical Review, June 25th), he said that for comparative purposes they might fairly take the figures appearing in the revenue account as representing the result of the first year's working under electric traction. The gross receipts of the joint system for the year amounted to £380,969, an increase of £59,713 over last year's figures, or 18·58 per cent. During the 12 months 44,380,221 passengers were carried, being 8,505,319 more than during 1906-7, and the car-mileage amounted to 7,767,008 miles, an increase of 752,009 miles, or, say, 10·72 per cent. Taking the working expenses, exclusive of the small amount of coal and cargo traffic, the increase was £23,520, or 10·77 per cent. over the previous year. Putting the items alongside the figures for 1906-7, they would observe that the maintenance cost of buildings, plant, permanent way and cars, was about the same as last year, and that consequent on the suppression of the horse traffic the items representing the maintenance of horses and harness had dropped from £18,797 to £3,267. The principal increases were general traffic expenses and wages, &c., £18,879, a large proportion of which was accounted for by the increased wages bill, and taxes and official imposts £4,737. The principal item here was the municipal 6 per cent. tax on the gross receipts, the amount of which would, of course, fluctuate with the traffics. As to the purchase of current, the increase had been £12,790, but against this had to be put the increase of 10·72 per cent. in the car-mileage. The percentage of working expenses to the gross receipts was 63·55 per cent. Last year the figures were 68·60, a reduction of, say, 5 per cent., which was extremely satisfactory. This company's proportion of the pooled receipts of the joint system for the year amounted to £91,447, as compared with £68,406 for the preceding 12 months, an increase of 33·68 per cent. The total number of miles constructed for electric traction to the end of March, 1908, was 86·82 miles. There were still to be constructed 24·96 miles, making 111·78 miles. Of the above 86·82 there were 4·97 miles not yet operated. As regards the future, he must sound a note of warning against exaggerated expectations. The traffics of the system, as a whole, continued to show increases month by month as compared with the previous year, but a new and active competition on the part of a rival line was affecting certain of their services, and they had seen in the newspapers statements of the formal consolidation of various tramways in Buenos Ayres. This company was working in harmony with this consolidation. He had always been of opinion, since he studied the tramway situation on the spot, that consolidation was bound to come about.

The report was adopted.

Bell's Asbestos Co., Ltd.—An interim dividend of 1s. per share, free of income-tax, has been declared for the half-year ended June 30th, being at the rate of 10 per cent. per annum.

Eastern Telegraph Co.—A first quarterly interim dividend of 1½ per cent. on the ordinary stock for the year ending December 31st, 1908, is declared.

Indian Electric Traction and Supply Co., Ltd.—The annual general meeting of this company was held on Monday at Orient House, New Broad Street, Mr. W. H. Cheetham presiding. In moving the adoption of the report, the chairman said that the expenditure up to December 31st last was £149,000. It was anticipated when the company was formed that the amount of £125,000 issued in construction debenture stock would suffice to complete the first portion of the company's undertaking by January 1st, 1907, and that from that date the revenue from the tramways alone would meet the expenditure. The capital expenditure had been in excess of the estimate, partly because the revenue had not come in to meet the debenture interest as soon as was expected. They anticipated that it would be necessary to issue further capital next year to pay off the indebtedness and to provide for extensions of mains. The supply side of the company was far more promising than the tramway. There had been a loss on the half-year's working of £6,681, including payment of interest. Mr. Cruickshank seconded the motion, and after some discussion the report was adopted.

India-Rubber, Gutta-Percha, and Telegraph Works Co., Ltd.—At the half-yearly meeting held at the offices in Cannon Street, on Tuesday (Major Darwin presiding), the directors' recommendation that a 2½ per cent. interim dividend be paid, was approved, and at a later special meeting the directors were authorised to issue new capital. At the first meeting the chairman made reference to the high prices of raw materials, which (says the *Times* report of the speech), had shown decided symptoms of a permanent lowering, although since the beginning of their financial year there had been ups and downs, and even at the present moment a slight stiffening had taken place. "This increase might be due to the present cheapness of money, which certainly enabled dealers to hold larger stocks at less cost than was the case a year ago." For india-rubber high prices could not be maintained without quite abnormal effort. "The increasing quantities of rubber from the plantations which had been springing into existence during the last eight or nine years must eventually tell their tale, and have their influence on the raw rubber market."

Financial Operations in Germany.—It is reported that the Allgemeine Electricity Co., of Berlin, has a scheme in hand for the formation of a new financing company, which would have an ordinary share capital of £1,250,000 and an issue of obligations raising the total capital to £3,750,000. The funds provided in this way would serve the purpose of proceeding with various electrical schemes which have been brought forward recently. The question is not one of immediate necessity, especially having regard to the condition of the market for securities bearing a fixed rate of interest. The Siemens Electrical Working Co. has resolved to raise a loan of £240,000 for the extension of its scope in the operation of electricity works. It is intended to issue the loan in Switzerland through the Handelsbank, of Basle, the loan being of the 4½ per cent. type.

Stock Exchange Notices.—The Committee has appointed a special settling day as under:—

Wednesday, July 8th.—County of Durham Electrical Power Distribution Co., Ltd.—£250,000 5 per cent. first mortgage debenture stock.

And ordered the undermentioned securities to be quoted in the Official List:—

County of Durham Electrical Power Distribution Co., Ltd.—£250,000 5 per cent. first mortgage debenture stock; and 10,000 additional ordinary shares of £10 each, fully paid, Nos. 1 to 10,000.

South Metropolitan Electric Light and Power Co.—Further issue of 25,000 7 per cent. cumulative preference shares of £1 each, fully paid, Nos. 207,009 to 232,008.

Anglo-Argentine Tramways Co., Ltd.—Mr. J. B. Concanon presided on Monday at an extraordinary general meeting at which a provisional agreement between this company and La Compagnie Générale de Tramways de Buenos Ayres was approved. A proposal to acquire a Buenos Ayres, 1900, concession, and all the issued shares of the Buenos Ayres Electric Tramways Co. (1901), Ltd., and one to vary a resolution passed last year relating to capital, were also approved.

Calcutta Electric Supply Corporation, Ltd.—The number of units delivered to consumers during the four weeks ended April 24th, 1908, were 564,508, compared with 434,915 units in the corresponding four weeks of 1907, and for the five weeks ended May 29th the figures were 700,232 in 1908, and 599,157 units in 1907.

Notting Hill Electric Lighting Co., Ltd.—The directors announce an interim distribution of 6 per cent. per annum and a bonus of 1 per cent. (together 8s. per share) on the preference shares and 6 per cent. per annum (6s. per share) on the ordinary shares for the past half-year.

Underground Electric Railways Co. of London, Ltd.—Sir George Gibb presided on Monday at a meeting of Profit-sharing Secured Note-holders. The scheme of arrangement between creditors of the company was approved.

O. C. Hawkes, Ltd.—An interim dividend at the rate of 5 per cent. per annum on the ordinary shares for the past half-year has been declared.

Provincial Tramways Co., Ltd.—The directors have declared an interim dividend of 3s. each on the ordinary shares.

Hobart Electric Tramway Co., Ltd.—The directors have declared a dividend of 1s. per share.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	Receipts for the fortnight. £+	No. of wks.	Total to date. £	Total to date. £+	Route miles open.	Inc.
Aberdeen	June 24	2,855	— 79	4	5,180	— 179	14·4	..
†Ayr	,, 20	376	+ 25	5	1,556	— 67	8	..
Bath	,, 24	1,557	— 105	25	16,953	— 1,409	13	..
Belfast	,, 26	7,557	+ 49	13	46,416	+ 572	37	..
Birkenhead	,, 28	2,165	+ 60	13	13,747	+ 697	13·52	..
Birmingham Corp.	,, 20	13,582	+1,481	12	75,151	+ 4,031	56·46	..
†Blackburn	,, 25	2,715	+ 700	..	10,457	+ 552	11·27	..
Blackpool Corp.	,, 27	1,608	+ 304	25	9,904	— 488	8·25	..
,, —Fleetw'd.	,, 28	4,954	+ 423	13	30,762	+ 1,479	26	..
Bolton	,, 10	3,507	+ 504	10	14,710	— 1,204	21·5	..
Bournemouth	,, 20	10,344	+ 799	12	55,650	+ 199	54·9	1
Bradford	,, 28	1,856	+ 88	13	11,158	+ 185	9·5	..
Brighton	,, 26	9,998	— 48	..	..	..	12·21	..
Bristol								
Brit. Elec. Trac. Co.								
Airdrie	,, 19	445	— 4	24	5,895	+ 55	3·65	..
Barnsley	,, 19	385	— 1	,,	4,182	+ 238	..	..
Barrow	,, 19	585	— 58	,,	5,558	— 53	5·57	..
Cavehill	,, 19	204	— 17	,,	1,983	+ 172	..	..
Devonport	,, 19	1,004	+ 404	,,	10,682	+ 11	8·35	..
Gateshead	,, 19	2,051	+ 53	,,	23,957	+ 196	11·25	..
Gravesend	,, 19	516	+ 13	,,	4,930	— 714	6·5	..
Greenock	,, 19	1,095	— 293	,,	12,119	— 3,308	7·25	..
Hartlepool	,, 19	562	— 69	,,	5,385	— 1,059	6·72	..
Kidderminster	,, 19	391	— 154	,,	2,349	— 118	..	..
Leamington	,, 19	488	+ 168	,,	3,652	+ 135	5	..
Merthyr	,, 19	498	+ 85	,,	5,027	+ 76	2·9	..
Metropolitan	,, 19	14,188	+3,947	,,	129,172	+25,852	22	..
Middleton	,, 19	1,003	+ 233	,,	8,402	+ 231	3·5	..
Mid. Joint Com'tee	,, 19	13,897	+2,805	,,	187,385	— 60	..	..
Oldham—Ashton	,, 19	1,806	+ 113	,,	14,267	+ 4	9·13	..
Peterborough	,, 19	315	+ 74	,,	2,799	+ 39	5·31	..
Potteries	,, 19	3,683	— 25	,,	44,001	— 87	29	..
Rothesay	,, 19	478	— 30	,,	2,588	— 178	2·75	..
Southport	,, 19	849	+ 228	,,	6,056	— 327	3·17	..
S. Metropolitan	,, 19	2,108	+ 453	,,	18,141	+ 456	..	..
Swansea	,, 19	2,167	+ 401	,,	21,541	+ 1,591	5·6	..
Tynemouth	,, 19	664	+ 125	,,	4,183	— 331	3·75	..
Weston-s-Mare	,, 17	547	+ 274	,,	1,638	— 86	3	..
‡Worcester	,, 19	720	+ 135	,,	6,271	+ 10	5·75	..
Wrexham	,, 19	256	+ 24	,,	2,376	+ 10	..	..
Yorks. Wool. Dist.	,, 19	1,091	— 44	,,	21,749	— 947	17	..
Miscellaneous	,, 19	411	+ 11	,,	4,648	— 351	..	..
Burnley	,, 27	2,420	— 15	..	..	..	7·5	..
Burton-on-Trent	,, 28	549	— 37	13	3,465	— 238	11	..
Bury	,, 21	2,795	+ 509	11½	14,130	+ 1,554	10·5	..
Carlisle	,, 27	379	+ 5	26	4,196	+ 30	..	..
Chatham and Dist.	,, 25	1,610	+ 113	25	17,961	+ 598	14·37	1·53
Cork	,, 19	1,463	— 13	12	16,996	+ 86	12	·75
Croydon	,, 27	380	— 58	13	2,562	— 187	..	..
Darlington	,, 25	507	— 34	12	3,259	— 54	4·36	..
Darwen	,, 18	263	+ 34	11	2,232	— 168	4·75	..
†Dover	,, 26	11,685	+1,362	26	129,005	— 2,810	54·25	5·5
Dublin	,, 24	2,438	+ 128	52	7,079	+ 590	14·5	..
Dundee	,, 27	1,768	— 92	13	10,986	— 549	7·75	..
East Ham	,, 27	37,215	+1,255	4	74,909	— 4,167	89·25	1
Glasgow	,, 25	1,107	+ 120	..	..	..	..	..
Hastings	,, 27	3,248	+ 54	13	21,325	+ 730	23·5	·5
Huddersfield	,, 27	4,757	— 112	20	28,805	— 67	12	..
Hull	,, 24	260	— 24	12	1,728	+ 95	3·5	..
Ilkeston	,, 27	605	— 37	13	9,891	— 41	10·5	..
Ipswich	,, 20	294	— 29	5	803	— 91	4·35	..
Kilmarnock	,, 25	2,719	+ 261	25	32,235	+ 3,813	15·82	..
Lan'kshire Trm Co.	,, 24	2,866	+ 336	25	31,012	+ 1,576	39	1
Lancashire United	,, 20	14,278	+ 729	12	76,761	+ 1,972	96	6·5
Leeds	,, 27	4,543	— 119	..	..	..	..	..
Leicester	,, 20	1,060	— 9	5½	2,792	— 103	6	..
Leith	,, 20	22,708	+ 390	25	261,323	— 1,866	104	..
Liverpool	,, 18	76,086	+12,403	..	361,883	+37,596	119·5	6
‡L.C.C.	,, 27	15,360	+ 690	..	158,991	+ 3,565	..	..
London United	,, 20	207	+ 6	26	6,163	+ 204	3·5	..
†Lowestoft	,, 27	31,166	+1,289	13	196,314	+ 9,245	85	11
Manchester	,, 27	9,978	— 781	13	50,292	— 4,857	..	..
Newcastle	,, 20	1,602	+ 127	12	8,089	— 889	14·5	..
Newport	,, 26	963	+ 66	12½	5,832	+ 349	5·5	..
Northampton	,, 28	4,156	+ 404	14	27,468	+ 675	38·75	..
Oldham	,, 27	655	+ 157	13	4,595	+ 1,133	5	1·75
Pontypridd	,, 27	4,440	— 209	13	25,083	— 125	14·5	..
Portsmouth	,, 24	1,484	— 44	..	..	..	..	..
Preston	,, 25	1,254	— 8	12½	7,021	+ 92	13·25	..
Reading	,, 25	1,160	— 25	12½	7,629	+ 168	10	·66
Rotherham	,, 22	8,987	+1,797	12	56,907	+ 136	38·9	..
Salford	,, 26	11,981	+ 33	13½	77,087	+ 67	36·25	·5
Sheffield	,, 24	2,115	+ 70	12	12,052	+ 1,001	..	..
Southampton	,, 24	888	+ 97	13	4,789	+ 813	..	..
Southend-on-Sea	,, 28	2,526	— 778	13	15,009	— 3,389	..	..
Sunderland	,, 17	138	— 21	..	..	..	4·4	..
†Swindon	,, 17	382	— 48	25	9,036	— 1,198	3·87	..
†Tyneside	,, 27	1,907	+ 184	12½	11,808	+ 617	8·72	·12
Wallasey	,, 18	1,635	+ 427	11	7,049	+ 787	9	..
Walthamstow	,, 16	4,908	+ 195	12	26,719	— 4,199	14·7	..
West Ham	,, 24	1,597	— 59	12	10,581	— 68	12·5	..
Wolverhampton								
Baker St.-Waterloo	,, 27	6,025	+ 790	26	79,410	+17,169	4·36	1
Cen. London Rly.	,, 27	14,836	+3,749	26	163,506	+ 5,964	5·77	..
Char. +, Eus. Hamp.	,, 27	6,690	+ 725	26	84,460	..	7·79	..
City & S. Lon. Rly.	,, 28	6,220	— 646	26	83,875	+ 5,575	7·3	1·06
Dublin-Lucan Rly.	,, 25	230	+ 27	26	2,912	+ 185	7	..
G.N. and City Rly.	,, 27	2,955	+ 551	26	43,788	— 3,428	5·5	..
G.N., P'dy. & Brmtn.	,, 27	11,190	+2,550	26	141,190	+88,461	9·25	·25
L'pool Overh'd Rly.	,, 28	2,934	— 121	26	36,841	— 827	6·5	4·5
Mersey Railway	,, 27	3,791	— 181	26	49,387	+ 1,532	4·5	..
Metropolitan Rly.	,, 28	33,506	+ 775	26	402,790	+ 4,598	24·3	..
Met. District Rly.	,, 27	19,173	+2,893	26	233,084	+25,401	24	..
Anglo-Argentine	,, 24	25,339	+3,494	26	462,326	+50,094	43	..
§Auckland	May 22	11,341	+1,095	20½	60,224	+ 6,344	20·92	1·72
§Brisbane	May	15,548	+2,273	..	..	..	..	..
†Buenos A. & Belgr'o.	June 17	3,495	— 154	25	91,207	+ 472	..	..
Calcutta	,, 27	5,007	+ 632	..	..	..	..	..
§Cape Electric T. Ld.	May	12,552	..	..	..	..	..	..
§Geneva	,,	9,190	+ 741	..	..	..	..	..
§Kalgoorlie, W.A.	,,	3,930	..	21	18,979	..	20·5	..
Madras	June 15	1,115	+ 180	24	13,974	+ 1,421	19·75	..
†Perth (W.A.)	,, 26	1,829	+ 2	26	36,226	— 944	25·6	25·6

Compared with the corresponding period of 1907. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Evening.

During the past week, apart from the fortnightly settlement, there has been very little business passing, while prices, on the whole, keep firm. There are many alterations in quotations, which, however, are chiefly due to dividend deductions.

Judging by the amount of business already done, it looks as if the old-time traditions of a 19-day account will hold good, and the sooner it is over the better.

The Electric Railway market has been very idle, and only a small amount of business has been booked. The decline in Central London issues has come to an end as regards the Ordinary Stock, the closing quotation being the same as last week. The Deferred is 1 lower. Metropolitan Consolidated has fallen a point, while Metropolitan District is also 1 per cent. lower.

In Telegraphs dealings have been restricted to very narrow limits, but prices have been well maintained, despite the lack of interest displayed in this section. The only exception has been a little weakness in Anglo-American descriptions, the Ordinary stock falling a point, while the Preferred and Deferred stocks are both ½ easier. Monte Video Preference advanced $\frac{1}{32}$.

Dealings in the new 4 per cent. Debenture of the Anglo-Argentine Tramways Co. have eased off a little, but the price is unchanged on the week, after reacting a little. The meeting of the British Electric Traction Co. passed off quietly, the proposal of the directors to reduce the Preference dividend to 3 per cent. meeting with little opposition. Dealings in the shares and Debentures have been on a small scale, and with the exception of a nominal rise of 1 per cent. in the first Debenture, the quotations show no change on the week.

British Aluminium 6 per cent. Preferences have gained ¼, and Telegraph Constructions are ½ up. The Rio de Janeiro Tramway, Light and Power new issue of 5 per cent. Bonds is quoted 4½-3½ discount.

In the Electricity Supply division prices have hardened up a bit on the decision arrived at by Lord Cromer's Committee that the different power Bills (with modifications) may all proceed to Parliament. It seems as if at last the question of power supply for London will be settled, for which shareholders in London companies will no doubt be thankful, having had this "bug-bear" hanging over their heads quite long enough.

Westminsters have changed hands pretty freely and close ½ up. Bromptons and St. James's have both advanced ¼. Kensingtons are £1 higher, while Notting Hills, besides recovering the dividend deduction, have risen ½. Many others have gained ½.

Brush Electrical Engineering Co., Ltd.—An extraordinary general meeting has been called for July 7th to confirm the resolutions already passed providing that each of the 150,000 fully paid non-cumulative 7 per cent. preference shares (£1 6s. 8d. each) be sub-divided into four fully paid non-cumulative 7 per cent. preference shares of 6s. 8d. each; and that each of the 105,732 fully paid ordinary shares (£1 6s. 8d. each) be sub-divided into four fully paid ordinary shares of 6s. 8d. each.

On the same day, at a subsequent extraordinary meeting, the following resolutions will be considered:—

1. That the fully paid non-cumulative 7 per cent. preference shares of the company be consolidated in such a manner that every three of the existing fully paid non-cumulative 7 per cent. preference shares of 6s. 8d. each shall constitute one fully paid non-cumulative 7 per cent. preference share of £1 each.

2. That the fully paid ordinary shares of the company be consolidated in such manner that every three of the existing fully paid ordinary shares of the company of 6s. 8d. each shall constitute one fully paid ordinary share of £1 each.

3. That each of the 74,268 unissued ordinary shares of £2 each in the company be sub-divided into two ordinary shares of £1 each.

Greenwood & Batley, Ltd.—The report for the twelve months ended March 31st, 1908, states that after providing for interest on the debentures and expenses of management and making due provision for doubtful debts, the accounts show a profit of £23,695, plus £654 brought forward, together £24,349. The directors have written off £5,000 for depreciation, and they recommend a dividend of 4 per cent. for the year on the ordinary share capital, carrying forward £5,451.

Harper Electric Piano Co., Ltd.—The directors recommend a dividend on the preference shares for the half-year ended June 1st at the rate of 10 per cent. per annum, carrying forward £733.

France.—The balance sheet of La Compagnie Continentale Edison, of Paris, for the last financial year, shows a profit of £144,675, as compared with only £69,575 in the preceding 12 months.

Eastern Extension, Australasia and China Telegraph Co.—An interim dividend for the quarter ended March 31st last of 2s. 6d. per share is announced.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Shares. *	Dividends for the last four years. 1904.	1905.	1906.	1907.	Closing Quotations June 23rd.	Closing Quotations June 30th.	Business done week ended June 30th, 1908. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	2 — 3	2 — 3	..	..	..	Nil
149,900	Do. do. 5 % Debs., Nos. 1 to 1,260 Red.	100	Nil	5 %	5 %	5 %	85 — 88	83 — 86 xd	..	..	..	5 16 3
$131,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7½%	7½%	8 %	8 %	120 —124	120 —124	122	..	..	6 8 9
58,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	90 — 93	90 — 93	..	..	..	4 6 0
598,180	Anglo-American Telegraph	Stock	2¾%	3½%	3½%	3½%	59 — 62	58 — 61	..	..	—1	5 14 9
8,200,910	Do. do. do. 6 % Pref.	Stock	5½%	6 %	6 %	6 %	104 —105	103½—104½	104⅛	103¼	— ½	5 14 10
8,200,910	Do. do. do. Deferred	Stock	Nil	1½%	12½%	1 %	16½— 16⅝	15⅝— 16¼	16 1/16	15 1/16	— ⅛	6 3 1
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	..	5 %	5 %	5 %	99 —102	99 —102	..	..	..	4 18 0
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	7½ — 7¾	7½ — 7¾	..	..	..	5 3 3
2,383,376	Commercial Cable Stng. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	84 — 87	83 — 86 xd	85½	84½	..	4 13 0
16,000	Cuba Telegraph	10	5 %	5 %	5 %	..	7½— 8½	7½— 8½	..	..	..	5 17 8
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	15½— 16½	15½— 16½	..	..	..	5 19 5
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	3 — 3½	3 — 3½	..	..	..	6 8 1
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	8 — 9	8 — 9	..	..	..	5 11 1
80,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	3 14 10
60,710	Direct United States Cable	20	3½%	4½%	4½%	..	13⅜—14⅛	13⅜—14⅛	13⅝	..	..	6 10 9
50,900	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,300, R.	100	4½%	4½%	4½%	4½%	100½—102½	99 —100 xd	..	..	..	4 10 0
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	7 %	133 —136	133 —136	135	133⅞	..	5 2 11
2,000,000	Do. 8½ % Pref. Stock	100	8½%	8½%	8½%	8½%	84½— 86½	84½— 86½	85⅞	84⅞	..	4 0 11
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	100½—102½	100⅝—102⅝	102¼	101⅞	..	3 19 1
300,000	Eastern Extension, Australasia, and China Tels.	10	7 %	7 %	7 %	7 %	12½— 13½	12½— 13½	13	12¾	..	5 5 8
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	100½—102½	100⅝—102½	102⅛	101	..	3 18 1
269,700	East & S. Afric. Tel., 4 % Mt. Db., 1 to 3,000, red. 1909	100	4 %	4 %	4 %	4 %	101 —103	101 —103	..	..	..	3 17 8
200,000	Do. 4 % Reg. M. Debs. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100 —102	100 —102	100	..	..	3 18 5
181,127	Globe Telegraph and Trust	10	5⅝%	5½%	5½%	5½%	10⅜— 10⅝	10⅜— 10⅝	10 1/16	10 1/16	..	5 8 9
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	6 %	13⅜— 14⅛	13⅜— 14⅛	14	13⅜	..	4 4 11
150,000	Great Northern Telegraph, of Copenhagen	10	24 %	24%	20 %	20 %	27½— 29½	27½—29⅛	28½	..	..	6 15 7
19,600	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,300, Red.	100	4½%	4½%	4½%	4½%	100½—101½	98 —100 xd	..	..	..	4 10 0
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	13 %	54 — 57	54 — 57	54½	..	..	5 14 0
$41,380,400	Mackay Companies Common	$100	1 %	2 %	3½%	4 %	60 — 70 xd	60 — 70	..	..	..	5 14 4
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	60 — 70 xd	60 — 70	..	..	..	5 14 4
384,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	Nil	⅞— 1	⅞— 1	..	..	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	4 %	5 %	6 %	6 %	1⅛— 1⅜	1⅛— 1⅜	..	..	..	4 14 1
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	⅝— ¾	⅝— ¾	18/9	..	+ 3/32	5 2 7
2,235,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	108½—110½	108½ 110½	109½	108½	..	5 8 7
8,725,000	Do. do. Def. Stock	100	5 %	5 %	5 %	6 %	113 —115	113 —115	114½	113	..	5 4 4
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½— 12½	10½— 12½	..	..	..	4 16 0
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	6 %	10½— 12½	10½— 12½	..	..	..	4 0 0
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅝— 6⅜	5⅝— 6⅜	5⅝	..	..	4 8 11
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	99½—101½	98 —100 xd	..	..	..	3 10 0
1,716,593	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	102½—104½	100½—102½ xd	101⅜	..	..	3 18 1
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	6⅜%	7 %	7 %	8 %	1½ - 1⅝	1½— 1⅝	36/9	..	..	5 15 4
50,000	Do. do. do. 6 % Cum. Pref. ..	1	6 %	6 %	6 %	6 %	1⅜— 1½	1⅜— 1½	..	..	..	4 18 0
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	..	4 %	4 %	4 %	90 — 93	88 — 91 xd	..	..	..	4 7 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	99 —102	97 —100 xd	..	..	..	4 0 0
11,839	Reuter's	8	5 %	5 %	5 %	5 %	7½— 8½	7½— 8½	..	..	..	4 14 1
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	..	4½%	4½%	4½%	99 —102	97 —100 xd	..	..	..	4 10 0
3,083	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	127 —130	..	..	..	4 12 4
100,000	United River Plate Telephone	5	8 %	8 %	8 %	8 %	6⅜— 6¾	6⅜— 6¾	..	..	..	5 16 4
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛ xd	..	..	..	4 15 3
30,008	W. Coast of America, 1 to 30,000 & 53,001 to 53,008	2	Nil	Nil	2½%	..	1⅛— 1⅛	1⅛— 1⅛	..	..	..	3 10 2
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	99 —102	99 —102	..	..	..	3 18 5
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980. ..	10	7 %	7 %	7 %	..	13⅜— 13⅝	13⅜— 13⅝ xd	13½	13⅜	..	5 0 11
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	101 —103	99⅜—101½ xd	..	..	..	3 18 10
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	⅜— ½	⅜— ½	14/-	12 1/16	..	Nil
84,563	Do. do. 6 % Cum. 1st Pref.	10	6 %	5 %	8 %	6 %	8½— 8¾ xd	8½— 8¾	..	..	..	6 17 2
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	Nil	£2 6 0	8 — 9	8½— 9½	8½	..	+ ½	2 9 0
80,000	D do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	101 —104	99 —102 xd	..	..	..	4 18 0

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

320,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,097	5	8 %	8 %	8 %	9 %	8 7/16— 8 11/16	8⅜— 8⅝	8 13/16	8½	— 1/16	5 4 4
260,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5½%	5½%	5½%	5⅝%	6¼— 6½	6¼— 6⅝xd	6 7/16	..	..	4 10 2
266,600	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	6 %	141 —146	138 —143 xd	143	..	..	4 8 11
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	104 —107	102 —105 xd	..	..	..	4 15 3
580,000	Babcock & Wilcox, 1 to 580,000	1	20 %	20 %	20 %	20 %	3 1/32— 4 1/32	3 1/32— 4 1/32	79/6	..	..	5 0 0
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1 3/16— 1 5/16	1 3/16— 1 5/16	..	..	..	3 16 10
40,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	7 %	3 — 3¼	3 — 3¼	..	..	..	10 0 0
40,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	4 — 4¼	4 — 4¼	..	..	..	7 15 7
20,000	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	4¼— 5	4¼— 5¼	..	..	+ ¼	5 14 3
20,000	Do. do. 4 % Funding Certs. ..	5	4 %	4 %	4 %	4 %	3¾— 4¼	3¾— 4¼	..	..	..	4 14 1
288,200	Do. do. 5 % 1st Mort. Deb. Stock Red.	Stock	5 %	5 %	5 %	5 %	104 —108	104 —108	..	..	..	4 12 7
300,000	Do. do. 5½ % Loch Leven Debs. ..	100	..	..	5½%	5½%	97 —100	97 —100	97/6	..	..	6 3 1
400,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	6 %	8 %	125 —130	125 —130	..	..	..	6 2 2
300,000	Do. 5 % Pref. Ord. Stock	100	5 %	5 %	5 %	5 %	108 —112	108 —112	109	..	..	4 9 8
300,000	Do. 5 % Cum. Perp. Pref. Stock ..	100	5 %	5 %	5 %	5 %	107 —111	107 —111	109⅝	..	..	4 10 1
323,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250 ..	40	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 8
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 2
183,301	British Electric Traction	10	6 %	8 %	Nil	Nil	1⅜— 1⅞	1⅜— 1⅞	..	..	..	Nil
161,487	Do. do. 6 % Cum. Pref.	10	6 %	6 %	6 %	8 %	4¼— 4⅝	4¼— 4⅝xd	91/3	88/9	..	6 6 4
1,473,653	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	92 — 97	94 — 97	96½	..	+1	5 3 1
528,936	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	75 — 77	75 — 77	75½	..	..	5 15 5
100,000	British Insulated and Helsby Cables	5	8 %	8 %	10 %	..	5⅞— 6¼	5⅞— 6¼	..	..	..	8 0 0
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6¼— 6⅝	6¼— 6⅝	..	..	..	4 16 0
500,000	Do. do. 4½ % 1st Mort. Deb. Red. ..	100	4½%	4½%	4½%	4½%	102 —105	100 —103 xd	..	..	..	4 7 5
212,000	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	93 — 98	93 — 98	..	..	..	4 11 10
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	Nil	1/16— 1/8	1/16— 1/8	..	..	..	Nil
1,016,858	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	45 — 50	43 — 48 xd	..	..	..	8 6 8
50,000	Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	Nil	3/16— 1/4	3/16— 1/4	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	Nil	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
105,731	Brush Electrical Engineering, Ord., 1 to 106,731 ..	2	Nil	2½%	Nil	Nil	0 — 1/8	0— 1/8	..	..	..	Nil
150,000	Do. do. Non-cum. 6 % Pref.	2	6 %	6 %	Nil	Nil	1/16— 1/8	1/16— 1/8	..	..	..	Nil
125,000	Do. do. 4½ % Perp. Deb. Stock	Stock	4½%	4½%	4½%	4½%	70 — 75	70 — 75	..	..	..	6 0 0
125,000	Do. do. 4½ % Perp. 2nd Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	55 — 60	53 — 58xd	..	..	..	7 15 2
100,000	Buenos Ayres & Belgrano, 1 to 100,000	5	4 %	3 %	3 %	..	4⅛— 4⅜	4⅛— 4⅜	..	..	..	3 1 6
40,000	Do. do. "A" 6 % Cum. Pref., 1 to 40,000	5	6 %	6 %	6 %	6 %	4⅜— 5⅛	4⅜— 5⅛xd	..	..	..	5 17 1
27,500	Do. do. "B" do., 1 to 27,500	5	6 %	6 %	6 %	6 %	4⅜— 5⅛	4⅜— 5⅛xd	..	..	..	5 17 1
185,400	Do. do. 5 % Deb. Stock	100	5 %	5 %	5 %	5 %	110 —116	110 —116 xd	..	..	..	4 6 2
190,000	Do. do. 5 % 2nd Deb. Stock	100	5 %	5 %	5 %	5 %	102 —105	102 —105 xd	..	..	..	4 15 3
137,610	Calcutta Trams, 1 to 137,610	5	8 %	8 %	8 %	6 %	5⅜— 6⅜	5⅜— 6⅜	5⅞	5⅜	..	4 14 1
30,000	Do. 5 % Cum. Pref., Nos. 1 to 29,230 ..	5	..	5 %	5 %	5 %	5 — 5⅜	5 — 5⅜xd	5 3/16	..	..	4 18 0
850,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	103 —105	101 —104 xd	..	..	..	4 6 7
35,000	Callender's Cable Construction shares	5	12½%	15 %	15 %	15 %	9½— 10½	9½— 10½	10⅜	..	..	7 2 10
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	5¼— 5⅜	5¼— 5⅜xd	5⅜	..	..	4 5 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	107 —109	105 —107 xd	..	..	..	4 4 1
491,222	Cape E Trams., 1 to 491,222	1	5 %	Nil	Nil	Nil	1/16— 1/8	1/16— 1/8	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	4 %	6 %	8 %	12 %	1¼— 1⅜	1¼— 1⅜	27/-	..	..	8 14 7
215,045	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
1,998,610	Central London Railway, Ord. Stock	Stock	4 %	4 %	4 %	3 %	75 — 78	75 — 78	76⅜	75½	..	3 16 11
553,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	90 — 92	90 — 92	92	90½	..	4 7 0
553,195	Do. do. Def. do.	Stock	4 %	4 %	4 %	2 %	55 — 59	55 — 58	58½	55	—1	3 9 0
1,100,000	City and South London Railway	Stock	3¼%	12%	3¼%	3½%	39 — 41	38 — 40	40½	39	—1	5 5 8

* Unless otherwise stated, all shares are fully paid. † A period of nine months. ‡ From Manchester Share List.

Continued on next page

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1904.	1905.	1906.	1907.	Closing Quotations June 23rd.	Closing Quotations June 30th.	Business done week ended June 30th, 1908. Highest.	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
85,000	Crompton & Co., Nos. 1 to 85,000	*	2½%	2½%	5 %	5 %	1⅛— 1⅞	1⅛— 1⅞	35/-	33/9	..	8 0 0
100,000	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	92 — 95	92 — 95	..	..	..	5 5 11
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1⅛— 1⅜	1⅛— 1⅜	..	..	..	7 5 5
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1 — 1⅛	1 — 1⅛	..	..	..	4 16 0
282,580	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	101—104	99 —102 xd	..	..	..	4 8 3
60,000	Dublin United Trams. (1896), 1 to 60,000	10	6 %	6%	6 %	6¾%	12½— 13½	12½— 13½	..	..	..	4 18 2
59,987	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	6 %	12½— 13½	12½— 13½	..	..	..	4 7 8
99,261	Edison & Swan Utd., "A" shs., £8 pd., 1 to 99,261	5	2½%	4½%	4½%	4½%	⅜— ⅝	⅜— ⅝	13/6	10/-	..	16 15 0
17,189	Do. "A" shares, 01—017,189	5	2½%	4½%	4½%	4½%	1½— 2⅛	1½— 2⅛	..	..	..	8 6 9
319,475	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	78 — 81	76 — 79 xd	..	..	..	5 1 3
72,220	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	85 — 87	85 — 87	..	..	..	5 14 11
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	⅛— ¼	⅛— ¼	..	..	..	Nil
31,890	Do. do. 7 % Cum. Pref., 1 to 31,890	2	7 %	7 %	Nil	Nil	1⅛— 1⅜	1⅛— 1⅜	..	..	..	Nil
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	5 %	7⅞— 8⅛	7⅞— 8 xd	..	..	..	6 5 0
900,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	87 — 90	87 — 90	..	..	..	4 8 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	4 %	¼%	⅜— 1½	⅜— 1½	..	..	..	3 6 8
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10½— 10¾	10½— 10¾	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	..	102 —103	102 —103	..	..	..	4 17 1
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15 %	15%	15 %	15%	10½— 11½	10½— 11½	10⅝	..	..	8 18 10
740,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	5 — 5⅛	5 — 5⅛	..	..	..	4 1 10
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	104 —106	104 — 106	..	..	..	4 4 11
50,000	India-Rubber, Gutta-percha & Telegraph Works	10	5 %	10%	10 %	..	15⅞— 16½	15⅞— 16½	16⅝	16 1/16	..	6 1 8
37,500	†Liverpool Overhead Railway, Ord.	10	1¾%	Nil	Nil	¾%	1⅜— 1⅝	1⅜— 1⅝	..	..	..	Nil
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	5½— 6½	5½— 6½	..	..	..	8 0 0
600,070	London United Trams. (1901), 1 to 50,007	10	6 %	3 %	3 %	..	6½— 6⅞	6½— 6⅞	..	..	..	4 8 11
399,930	Do. do. 50,008 to 100,000	10	6 %	3 %	3 %	..	6½— 6⅞	6½— 6⅞	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	5 %	7½— 8½	7 — 8 xd	..	..	..	6 5 0
1,881,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	81 — 86	79 — 84 xd	81	..	..	4 15 3
5,782,062	Metropolitan Consolidated	100	3 %	2%	1 %	½%	40 — 41	39 — 40	40½	37⅝	—1	1 5 0
2,640,914	Do. Surplus Lands	100	2½%	2½%	2½%	2½%	68 — 70	68 — 70	69½	68	..	3 18 7
3,285,000	Do. District	100	Nil	Nil	Nil	Nil	13 — 14	12 — 13	13	12½	—1	Nil
314,016	Metropolitan Electric Trams., Defd.	1	Nil	Nil	Nil	..	3/32— 5/32	3/32— 5/32	9d.	..	..	Nil
600,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	7/32— 9/32	7/32— 9/32	..	..	..	6 3 1
350,000	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	95 — 98	93 — 96 xd	..	..	..	4 13 9
245,500	Potteries E. Tro.	1	5 %	4 %	4 %	4 %	⅛— ¼	⅛— ¼	..	..	..	3 0 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	⅛— ¼	⅛— ¼	..	..	..	6 13 4
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	93 — 96	93 — 96	..	..	..	4 13 9
87,850	Telegraph Construction and Maintenance	12	15 %	15 %	15 %	17½%	30½— 32½	31 — 33	31½	31	+ ½	6 5 0
150,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	102 —104	102 —104	..	..	..	3 16 11
8,599,200	Undergd. E. R., Lon., 5 % Profit Shar. S. Nts.	..	5 %	5 %	5 %	5 %	39 — 43	39 — 43	..	..	..	11 12 6
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	Nil	Nil	Nil	10 %	⅜— 1½	⅜— 1½	..	..	..	8 0 0
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	Nil	Nil	..	6 %	3⅜— 3⅝	3⅜— 3⅝	65/-	..	..	8 6 5
46,404	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	70 — 74	70 — 74	..	..	..	5 5 3

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) H.L. & P,. 1 to 15,000	5	5½%	5½%	5½%	5½%	4⅛— 5	4⅛— 5	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	94 — 97	94 — 97	..	..	..	4 10 11
30,131	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10 %	10 %	10 %	6⅜— 7⅜	7 — 8	..	..	+ ½	6 5 0
9,869	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	6⅜— 7⅜	6⅜— 7⅜	..	..	..	4 10 4
336,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	98 — 101	98 —101	..	..	..	3 19 3
80,000	Charing Cross and Strand Electricity Supply	5	8 %	5 %	5 %	5 %	3⅝— 4⅛	3⅝— 4½	..	..	+ ⅛	5 17 8
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4⅛— 4⅜	4⅛— 4⅜	80/-	77/6	..	4 17 4
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3¼— 4⅛	3½— 4¼ xd	..	..	..	5 17 8
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	95 — 98 xd	95 — 98	..	..	..	4 1 8
49,436	Chelsea Electricity Supply, Ord.	5	6 %	6 %	4½%	4½%	3 — 3⅛	3 — 3⅛	63/9	..	..	6 8 7
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	101 —104	99 —102 xd	..	..	..	4 8 3
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	9⅛— 10⅛	9⅛— 10⅛	10	9⅝	..	5 14 3
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12 — 13	12 — 13	..	..	..	4 12 4
460,000	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	124 —127	122 —125 xd	..	..	..	4 0 0
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	102 —105	100 —103 xd	..	..	..	4 7 5
40,000	County of Durham Electrical Power, Ord.	5	£3 7 0	4 %	4 %	2 %	2⅛— 3	2⅛— 3	..	..	..	3 6 8
80,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	3⅛— 4⅛	3⅛— 4⅛	..	..	..	5 17 8
40,000	County of London Electric Lighting, Ord. 1—40,000	10	4½%	5 %	5 %	5 %	7⅛— 8⅛	7⅛— 8⅛	..	..	+ ⅛	6 1 3
40,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10⅛— 10⅝	10⅛— 10⅝	..	..	..	5 9 1
400,000	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	107 —110	105 —108 xd	..	..	..	4 3 4
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	98 —101	98 —101	99¾	98⅛	..	4 9 1
80,000	Edmundson's Electric Corporation, Ord. Shares	5	7 %	4 %	Nil	Nil	⅛— ¼	⅛— ¼	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	3 %	Nil	¾— 1	¾— 1	..	..	..	Nil
488,000	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	68 — 73	68 — 73	..	..	..	6 3 3
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	5½%	4⅜— 5⅛	4⅜— 5⅛	..	..	..	5 4 9
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	..	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..	4 10 11
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	94 — 97	95 — 98	..	..	+1	4 11 10
15,000	Hove, 1 to 15,000	5	8½%	9 %	9 %	8½%	6 — 6¼	6 — 6¼	..	..	..	6 10 9
21,000	Kensington and Knightsbridge Electric Ord.	5	12 %	10 %	10 %	10 %	7 — 8	8 — 9	8 1/16	..	+1	5 9 7
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	96 — 99	96 — 99	..	..	..	4 0 10
10,000	London Electric Supply Corporation, Limited, Ord.	3	3 %	4 %	4 %	2½%	⅞— 1⅛	⅞— 1⅛	..	..	..	5 8 1
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	4⅛— 4⅜	4⅛— 4⅜	..	..	+ ⅛	6 3 1
74,395	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4 %	4 %	4½%	89 — 92 xd	89 — 92	..	..	..	4 17 10
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	10 %	8 %	6½%	4⅛— 5	4⅛— 5	..	..	..	6 10 0
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4⅛— 5	4⅛— 4⅞ xd	..	..	..	4 12 4
220,000	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	107 —111	105 —109 xd	..	..	..	4 2 7
250,000	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	85 — 90	84 — 89 xd	84	..	..	3 18 8
260,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	96 — 99	94 — 97 xd	..	..	..	4 12 9
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	8 %	5½— 6	5½— 6	..	..	..	6 13 4
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	5 %	5½— 5¾	5½— 6	..	..	+ ⅛	4 8 4
10,352	Notting Hill Electric Lighting	10	7 %	7½%	7½%	7½%	11½— 12½	12 — 13 xd	13	..	..	5 15 5
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	7 %	5⅝— 6¼	5⅝— 6¼	..	..	..	5 12 0
80,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	94 — 98	94 — 98	..	..	..	4 1 8
40,000	St. James' and Pall Mall Electric Light, Ord.	5	14½%	12½%	10 %	10 %	7⅛— 8⅛	7⅛— 8⅛	..	..	+ ½	5 17 8
20,000	Do. do. 7 % Pref. 20,021 to 40,020	5	7 %	7 %	7 %	7 %	6¾— 7¼	6¾— 7¼	..	..	..	4 16 7
150,000	Do. do. 3½ % Deb. Stock Red.	100	3½%	3 %	3½%	3½%	85 — 90	83 — 88 xd	..	..	..	3 19 7
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	4 %	Nil	Nil	¼— ⅜	¼— ⅜	..	..	..	Nil
80,000	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	70 — 74	70 — 74	..	..	..	5 8 1
65,000	South London Electricity Supply, Ord.	5	4 %	4 %	3 %	4 %	2⅜— 2⅝	2⅜— 2⅞	52/6	51/-	+ ⅛	6 19 2
120,000	South Met. Elec. Lt. & Power, Ord.	1	Nil	2½%	2½%	2½%	⅜— ½	⅜— ½	..	..	..	3 6 8
117,268	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1 1/16— 1 1/16	1 1/16— 1 1/16	..	..	..	5 6 8
200,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	1 — 2	1 — 2	20/-	..	..	12 10 0
60,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	1⅛— 2⅜	1⅛— 2⅜	..	..	..	10 10 6
200,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	87 — 90	87 — 90	..	..	..	5 0 0
110,000	Westminster Electric Supply, Ord.	5	14 %	18 %	12 %	10 %	7⅛— 8	7⅛— 8⅛	8 1/16	..	+ ⅛	5 14 3
81,870	Do. do. 4½ % Cum. Pref. (Original 5 %.—Red. to 4½ % from 31st Dec., 1905)	5	5 %	5 %	4½%	4½%	4⅛— 5⅛	4⅛— 5⅛ xd	..	..	..	4 5 9

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. ‡ Interim Dividend.

Bank rate of Discount 2½ per cent. May 28th, 1908.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING MAY, 1908.

The May values for electrical business fully maintain the excellent record of the earlier months of the year.

The exports from the country, at £203,063, are some £8,000 in excess of the total attained in April.

The imports, which reached a total of £156,150, are some £11,000 less in value than in the preceding month, while the re-exports of foreign and colonial goods from this country, amounting to £12,279, were also somewhat less in value than in April.

It is interesting here to notice that the average value of the goods exported during the first five months of 1908 amounted to 199·0 thousands, this comparing with 167·7 thousands the corresponding average for the whole of 1907.

Over the same periods the imports of electrical goods have made much less progress, the five months average of this year amounting to 161·0 thousands, which compares with 154·0 thousands during 1907. Touching the individual items, a somewhat smaller machinery export value was counterbalanced by improved business in cables, while other items showed considerable advances; the imports, on the other hand, show an improvement in machinery, with a counterbalancing reduction in cables, &c. Some £29,000 worth of electric lamps entered this country during the month.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.*

Country receiving exports and importing.	Electrical goods and appliances.	Electrical cable.	Electric lighting fittings and accessories.	Electric lamps.	Electric meters and instruments.	Electric machinery.	Batteries and accumulators.	Carbons.	Telegraph and telephone material, and electric bells.	Electrically-driven machinery.	Tramway apparatus and materials.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	...	1,887	121	22	204	1,901	45	...	5	320	...	4,505
Germany	221	850	5	76	168	223	45	...	79	...	...	1,667
Netherlands	415	842	4	30	...	140	15	121	162	...	...	1,729
Belgium	186	763	5	22	155	502	13	...	1,686	...	...	3,332
France	550	...	71	806	57	948	92	...	5	...	...	2,529
Portugal, Madeira and Portuguese Africa ...	18	1,561	4	187	88	1,327	22	...	118	12	...	3,337
Spain and Canary Isles	34	11	10	18	761	811	10	12	...	...	...	1,667
Italy and Austria-Hungary	289	530	54	144	946	4,874	...	...	...	...	...	6,837
Greece and Turkey	35	35	...	...	...	10	...	...	...	...	...	80
Channel Isles, Gibraltar and Malta	98	258	35	45	168	3,098	...	3	27	...	...	3,732
U.S.A. and Philippines	11	619	20	92	32	147	17	...	60	...	...	998
Canada and Newfoundland	542	957	125	23	63	735	106	7	...	...	...	2,558
British West Indies and British Guiana ...	8	14	32	5	...	15	...	12	...	...	...	86
Mexico, Colombia, Nicaragua, Gautemala, Venezuela and Panama	88	212	...	15	...	235	4	...	...	...	...	554
Peru and Uruguay	211	152	90	29	...	82	153	...	...	...	...	717
Chile	...	1,109	419	73	...	1,777	...	...	...	...	...	3,378
Brazil	403	426	295	194	105	3,416	227	28	23	290	...	5,407
Argentine	864	3,651	540	1,737	85	12,986	290	85	589	...	...	20,827
Egypt	900	796	64	210	128	1,568	74	56	231	...	...	4,026
British West Africa	112	2	27	...	...	10	11	...	80	...	...	242
Cape of Good Hope	730	251	14	344	57	1,505	4	...	6	...	...	2,911
Natal	957	2,904	225	549	374	3,588	164	20	89	27	...	8,897
Zanzibar, Brit. East Africa, Mauritius & Aden	14	...	...	80	...	...	6	27	232	63	...	422
China and Siam	1,024	7,068	559	362	49	2,703	265	49	57	...	...	12,136
Japan	1,333	3,597	35	190	712	9,167	86	...	61	72	...	15,253
Java and Dutch Borneo	12	...	...	9	...	15	...	10	...	...	...	46
India	1,402	8,853	1,432	1,576	1,851	11,492	1,287	235	712	3,042	...	31,882
Burmah	221	687	134	55	15	7,189	252	...	481	34	...	9,068
Ceylon	44	343	92	80	...	187	16	2	56	45	...	865
Straits Settlements and Fed. Malay States ...	169	258	225	322	769	507	127	56	23	...	...	2,456
Hong Kong	428	1,778	29	172	...	3,554	17	...	16	...	...	5,994
West Australia	251	2,465	12	...	6	1,543	910	...	8	...	...	5,195
South Australia	109	557	40	186	109	55	3	...	75	...	...	1,134
Victoria	1,072	5,990	85	191	...	489	75	...	101	...	...	8,003
New South Wales	1,415	6,579	564	1,148	881	6,484	1,233	192	599	...	...	19,095
Queensland	205	68	12	83	3	...	103	...	690	...	...	1,164
Tasmania	30	489	...	2	...	...	...	...	...	...	...	521
New Zealand	2,479	4,406	435	365	71	1,722	67	...	222	36	...	9,803
Total, £	16,880	60,968	5,824	9,442	7,857	85,011	5,739	915	6,492	3,941	...	203,063

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

	£	£	£	£	£	£	£	£	£	£	£	£
Norway, Sweden and Denmark	...	15	...	10	...	725	442	193	4,241	...	...	5,626
Germany	1,871	12,960	850	8,740	362	30,007	593	3,135	2,307	247	...	61,072
Holland	306	4,065	396	17,773	4,057	3,323	197	6,372	376	80	...	36,945
Belgium	745	5,290	1,010	1,479	27	5,887	155	837	7,055	...	...	22,485
France	103	3,104	1,403	995	615	238	2,941	2,383	174	10	...	11,966
United States	2,392	76	1,464	224	...	10,600	214	524	36	2,259	...	17,789
Total, £	5,417	25,510	5,123	29,221	5,061	50,780	4,542	13,444	14,189	2,596	...	155,883

Additional Imports: Italy, cable, £34; electrical machinery, £6; also electrical machinery from Canada, £155; and Queensland, £72.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

	£	£	£	£	£	£	£	£	£	£	£	£
Various countries, mainly as above	2,302	2,628	...	1,899	44	2,411	409	525	2,061	...	...	...

Total Exports: £203,063. Total Re-Exports: £12,279 Total Imports: £156,150

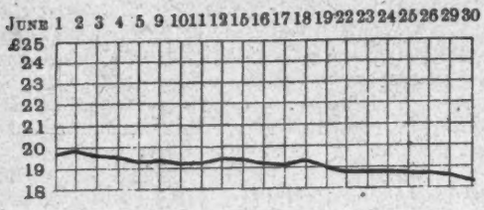
Note.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns.

* This section does not include telegraph cables and apparatus.

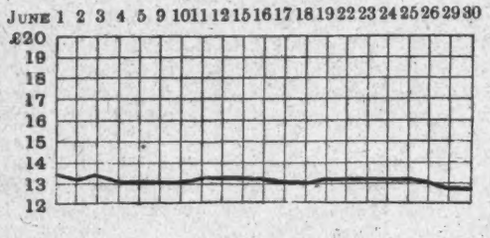
METAL MARKET.

Fluctuations in June.

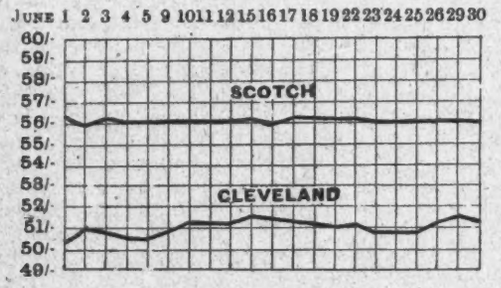
SPELTER (G.O.B's.).



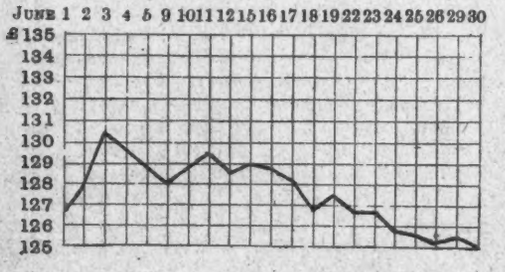
LEAD (ENGLISH).



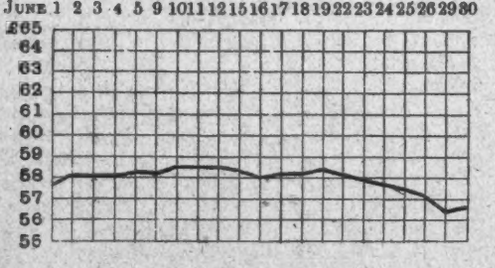
IRON.



TIN.



COPPER (G.M.B's.).



Prospectuses.—*West Kootenay Power and Light Co., Ltd.*—This company has this week been offering for subscription £240,000 first mortgage 6 per cent. bonds of £100 each. The company has lately acquired the Cascade Water-Power and Light Co., and thus secures the practical control of hydro-electric power supply in the central portions of Southern British Columbia.

Sekong Rubber Co., Ltd.—50,000 shares of £1 each in this company have been offered this week at par.

TANGLED TOPICS.

By "INNOCENS."

Are any engineers necessary?

An examination of the trend of modern events shows that a most unsettling and distressing spirit is creeping into the electrical profession. It may be briefly summarised in the disyllable "Cutting." What with rate-cutting by central station financiers, price-cutting by manufacturers who want to kick the bottom out of the mercantile bucket, the cutting-out of local contractors by wholesale firms, and the direct cut which the wife of the borough engineer (named "Civil") gives to the wife of the borough electrical engineer, it is a wonder there is anything left to cut at. We are rapidly getting into the parlous condition of the "three sailors of Bristol City, who took a boat and went to sea," so feelingly depicted in the lines :—

> Says gorging Jack to guzzling Jimmy,
> "I am extremely hungaree."
> To gorging Jack says guzzling Jimmy,
> "We've nothing left, us must eat we."

and before long we shall be saying to one another :—

> "Oh, Billy, we're going to kill and eat you,
> So undo the button of your chemie,"

and the weaker brethren amongst us will follow the line of conduct of Billy, who "used his pocket handkerchie."

The desperate pass to which things have come is amply shown by the discussion which is now raging as to whether consulting engineers are necessary. I envy the temerity of the gentleman who raised that query. To me he appears as noble and statuesque as Cromwell must have stood when, in his sublimest moment, he exclaimed "Take away that bauble!" Personally, I would as soon have hob-nobbed with Ajax when he defied the lightning, or stood in the shoes of the first socialist who howled "Down with the House of Lords," as be that man. A consulting engineer, raised to a high static potential by means of friction, and emitting disruptive discharges, is a most suitable object to place upon an insulating stand and to handle with rubber gloves and a long pole.

Yet, I venture to broach a mightier theme. We have considered the Throne on which Consulting Majesty resides. Let us now nerve ourselves to discover that there is a power behind the throne; and this has been revealed unto us by a Scottish seer, who is, forbye, a Bailie and a convener of an electricity committee. Fifteen years ago, as explained to the Municipal Association, the Hielan' Elders o' Govan got a provisional order for lighting. "It was not obtained with the immediate intention of putting it into operation." As the Bailie remarks: "At this time we were merely coquetting with the question." The naughty men! My word, if we had caught them bending! This flippant state of things could not be expected to last. They found themselves, in the giddy whirls of coquetry, at last face to face with three alternatives, either to hand over their order to a private company, to hand it over to Glasgow, or to carry it out themselves. Valuable considerations saved them from the first two disasters. They fell into the third alternative.

They determined to take the advice of an expert. The first name which was suggested to them was that of an eminent London engineer. Most people, dazzled by the radiance that emanates from the precincts of Westminster, would have shut their eyes and flung themselves blindly into the arms of that consulting engineer. Not so Govan. With Scottish caution, "although we had gone so far on our way we still wanted to leave ourselves free to go back on our tracks if necessary. We therefore, in asking for a report, requested him to state his fee in the event of our failing to go on with the scheme."

What could be fairer? Yet, in reply we detect the autocracy of the Upper House. "His answer was, that he would make no report unless we were prepared to go ahead." This was too painful. As the Bailie puts it, "Such an answer was unfair. We were in the position that *we knew nothing*; we wanted information; we wanted a scheme presented upon which *we could give an intelligent decision.*" Who said, "Ex nihilo nihil fit?" They then turned to a local engineer, who was "more amenable to our views."

He got out a scheme which, after deliberation, was carried out. We are gratified to learn that, "viewed in the light of to-day, it was not a bad scheme." This, in spite of the fact that if the buildings had been of greater height and breadth, the expense of taking a good part of them down would have been spared. Why are we so reminded of that curate's egg? But even here the Govan men did not lose their equipoise. They remembered that there were men before there were engineers. "In the staffing of the station, the Committee did not always follow the advice of the consulting engineer, nor did they allow the resident engineer to guide them altogether in the subordinate appointments." I hasten to turn in this connection to the final dicta of the good Bailie, in which he insists on the necessity of a good understanding between the Committee and the Chief Executive Officer. "This can only be attained if there be mutual sympathy on the part of the Convener and the official, and in order to secure that, it should be a necessary part of the engineer's duties to keep the Convener constantly informed of the doings of his department. He should acquaint him with its progress and developments, and also with all disappointments or 'regrettable incidents' which may have occurred."

This is the revelation. Too long has the troubled, toiling engineer laboured under the empty pomp of the position of borough (or burgh) electrical engineer without the refuge of a strong and manly breast to which he can fly, and upon which he can lean and sob out his sorrows. There is, or should be, in every well equipped community, a power behind the Throne—the Convener of the Electricity Committee. And when we have such a power, at once so strong and sympathetic, combining the ripeness of years, the milk of human kindness, and technical knowledge born of wrestling with "regrettable incidents," are we not forced to ask the question: "Are *Any* Engineers Necessary?"

THE EDUCATION AND SCIENCE SECTIONS OF THE FRANCO-BRITISH EXHIBITION.

Although the Education Section had not been formally opened at the time of our visit, this portion of the Exhibition has now been completed for some weeks. Anyone who is at all interested in education, either elementary, secondary, or technical, will find it difficult to tear himself away from this section when once he has entered it. As represented at the Exhibition, the immense range and variety of the subjects now taught in day schools is such as to make the ordinary average person feel very much more ordinary and more average than usual. Some of the work exhibited, done by infants averaging about seven years of age, is really amazing to one who finished his school days from, say, 10 to 15 years ago.

The manual work, too, which is turned out by the students both in the provided schools and in the higher grade schools, is very creditable. Whether or not we agree with the teaching of trade subjects in public schools, there is no doubt that where workshops are provided in which youths can practise handicraft as a pastime, considerable dexterity in the use of tools is shown by some of the students, more particularly in the departments of wood-turning and carpentry. Photographs of such things as cricket pavilions and garden seats, made by the students at the Bootham School, York, indicate a very high degree of excellence in handicraft work of this particular variety. We were interested also in noticing an exhibit from this school of a set of turned chessmen made by J. H. Holmes in 1873, when a youth of 15, and a student at this school. Mr. Holmes, who, as is well known, was the founder of the firm of J. H. Holmes & Co., Newcastle-on-Tyne, is still noted for his skill at the lathe.

A large variety of manual work is exhibited by various technical institutions, some of this being equal to the best work that could be turned out by skilled mechanicians.

At the Regent Street Polytechnic stand are shown a ballistic galvanometer, standard magnet, d'Arsonval galvanometer, transformer with adjustable air-gap, magnetic balance and potentiometer, all made by the students at this Polytechnic.

The exhibit of the Northampton Institute covers an unusually wide range of handicraft, including specimens of electrotyping, both bronzed and silver-plated, including some silver-plated lace; also such products of the electric furnace as carborundum and calcium carbide, both made in the Institute's laboratories. Some good examples of brass-finishing work are shown in the samples of plug switches and telegraph keys, and in heavier electrical engineering work an interesting exhibit of work done in the laboratories is a multipolar dynamo with laminated fields and barrel-wound armature. To illustrate wiremen's work, various samples of cable joints are shown, including joints in lead-covered concentric cables, and in three-core cables.

The Brighton Technical School exhibits a vertical engine, whilst the Battersea Polytechnic shows some very creditable draughtsman's work, including detail drawings of a locomotive type boiler and fire box, 40-H.P. Diesel engine, and four-cylinder petrol motor. A wiring board illustrating the wiring of one floor of a house is also very well done.

Joiners' work would appear to be one of the strong points in the West Ham Municipal Technical School curriculum, this institute exhibiting a number of patterns for the foundry, including patterns and core boxes for a three-throw hydraulic pump.

Several sets of wiremen's work are exhibited by students competing for County Council scholarships. These will be found alongside the exhibits of the Regent Street Polytechnic.

The most comprehensive exhibit of all in connection with technical education is that of the Manchester Municipal School. Here, in addition to samples of work done by trade students, are a number of very interesting exhibits illustrating apparatus used in technical classes, and also some very valuable historical exhibits, including Joule's laboratory note-books, horse-shoe and bar magnets used by him, together with apparatus to illustrate electro-magnetic rotations. The scientific papers of Joule and Sturgeon's lectures on electricity are on view. In connection with teaching apparatus there is shown a universal lathe-tool dynamometer to measure the forces acting upon a cutting tool in all directions, and also an apparatus for making experiments to determine the torque and feed pressure of drills when drilling into various metals at various speeds. In connection with the experimental and research work carried out at the school may be seen rubber cable punctured with 7,000 volts, a glass terminal rod punctured with 100,000 volts, photographs of high-tension discharges between horn arresters and over insulators, and, in connection with the latter, among the most interesting photographs are those showing the pioneer spark and the following-up arc. Some very good samples of the work turned out by the students are shown, including lamp resistances, low-resistance bridge, Deprez d'Arsonval galvanometer, magnetometer, metre bridge, ammeters, voltmeters, &c. A very well drawn set of wiring plans for a private installation is also exhibited, together with specimens of joints.

It must not be supposed that the foregoing exhausts the list of interesting electrical features in the Education Section. It really merely touches the fringe of the subject; to deal exhaustively with it would require far more space than can be here devoted to it.

The Science Section is another department which cannot fail to have considerable attractions for electrical engineers, whether engaged in telegraph work or in the heavier engineering side of the industry. A large number of the exhibits are chiefly of historical interest, and those who care to inquire into the genesis of some of the instruments now in common use, and to follow up the steps of evolution through which they have passed before reaching their present form, could not do better than pay a visit to the case of apparatus exhibited by Profs. Ayrton and Perry. Here they will find the first ohmmeter constructed by these pioneers in 1881, the second form designed in 1882, and also several stages in the evolution of the secohmmeter. Compared with the present forms of these instruments the early forms are delightfully crude and amateurish.

The first gaining-clock energy meter is also to be seen at

this stand, the meter which was the forerunner of the now largely used Aron meter.

Exhibited by Sir J. W. Swan are several types of incandescent lamp, including what is probably the oldest of its kind with an authentic history; other samples show the development of the lamp up to its present form.

To go still further back in the history of electricity, we may refer to the Leyden jars exhibited by the Duke of Devonshire, these having belonged to, and been used by, Henry Cavendish in the 18th century.

Of very considerable historical interest are the exhibits of the Wheatstone Laboratory, King's College, containing a set of original Daniell batteries, the original Wheatstone bridge, and the rotating mirrors used by Wheatstone to determine the velocity of electricity along wires.

Admirers of Faraday—and who interested in electricity is not one?—will examine with interest the large Russian lodestone used by the father of electrical engineering in connection with his original experiments in electromagnetic induction. Some of the coils used by Faraday's American contemporary, Henry, are also exhibited.

Telegraph engineers will not fail to look at the collection of apparatus exhibited by Sir William Preece, the exhibits including a piece of the first electric telegraph line laid in 1837, together with other pieces of early cables.

The Post Office exhibit contains a number of samples of telegraph cables, including lead-covered cable perforated by lightning, and also a complete installation of the electromagnetic induction system of wireless telegraphy as used by the G.P.O. in 1897 between Lavernock and Flatholm.

Station engineers will feel there is a bond of sympathy between them and the P.O. engineers when they see the piece of underground telegraph cable which was damaged by a workman's pick during some floods in April, 1908. It is stated that the removal of this fault cost about £100.

Other interesting telegraph instruments, including those used in railway working in the early days, are shown by Mr. George Neale.

Mr. Marconi has a very comprehensive exhibit of some 33 pieces of apparatus, and photographs illustrating the developments of wireless telegraphy.

The latest form of wire telegraphy, namely, electrical transmission of photographs and pictures, is illustrated by Mr. Shelford Bidwell, who shows the original model of an apparatus constructed in 1881 for this purpose.

The Cambridge Scientific Instrument Co. have on view a very fine selection of galvanometers, electrometers, and other instruments with which their name is so closely associated.

Many other exhibits might be referred to, bearing not only on electrical science, but on practically every other branch of applied science; enough has, however, been said to indicate the claims which this section has upon the attention of electrical engineers.

It might be added that the Hall of Science is building No. 11, and is on the left-hand side of the Wood Lane Entrance Hall. The Education Section is on the right-hand side of the Court of Honour.

Wimbledon Electricity Supply.—The L.C.C. has sanctioned the borrowing by the D.C. of the following amounts for work in connection with the undertaking:—£2,606 for new remote control switchboard and gallery and stairway at electricity works, Durnsford Road; £1,240 for extensions of buildings and foundations for engine and boilers (after deducting £310, outstanding debt on old buildings); £7,575 for new 1,000-kw. turbo-alternator, with platforms, cables, &c.; £4,710 for two water-tube boilers and economisers.

SOME SIEMENS MACHINES FOR THE WAR DEPARTMENT.

By the courtesy of Messrs. Siemens Bros. Dynamo Works, Ltd., we are enabled to give particulars of some interesting machines which they have recently supplied to the War Department.

Fig. 1 shows one of two large generators, which are of special interest, as being amongst the largest machines yet built with commutation poles. They will be driven by triple-expansion vertical type steam engines made by Messrs. Yates & Thom. The armatures are directly bolted to the engine fly-wheels.

There are 14 shunt-wound main poles, and an equal number of commutation poles, round each of which the whole current of the machine passes in turn. Each machine is designed to give 2,900 amperes continuously, at from 500 to 530 volts as shunt generator, when driven at 85 R.P.M., the specified temperature rise of the hottest part after 12 hours' run on full load being not more than 70° F., and the efficiency not less than 93 per cent. by the Hopkinson test. The specified overload capacity is 25 per cent. for two hours. These specified figures were more than fulfilled on test, the temperatures coming out very low and the efficiency 94 per cent., that is, 1 per cent. above guarantee.

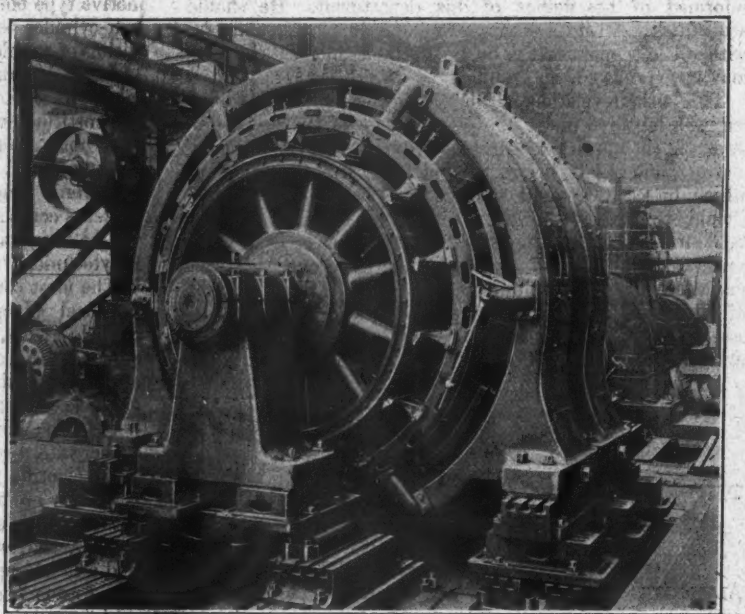


FIG. 1.—SIEMENS 1,500-KW. DYNAMOS ON HOPKINSON TEST.

The yoke is of cast-steel, and the main poles are laminated throughout; both the latter and the commutation poles can be removed without dismantling the machine. The armature is of the slotted drum type, and is built up of soft iron laminations, with specially small hysteresis losses. It is mounted on a cast-iron spider, and is well provided with ventilating ducts. Former-wound and interchangeable armature coils are employed, and are

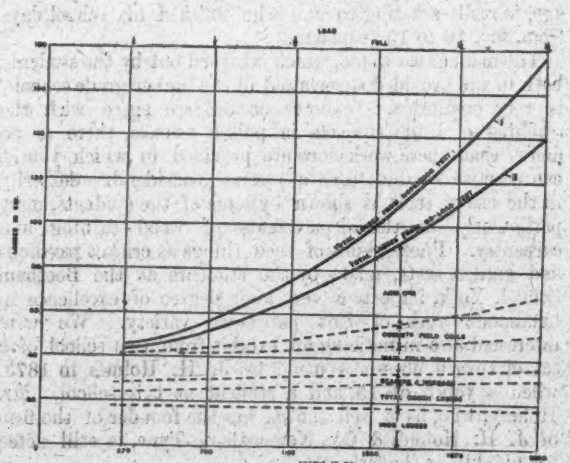


FIG. 2.—ANALYSIS OF LOSSES.

kept in place in the slots by wooden wedges through the whole of their length, the end connections being secured against displacement by centrifugal force by a special steel binding ring, easily removable.

The insulation of the coils consists of layers of mica and press-spahn, which are held together with shellac and moulded while hot

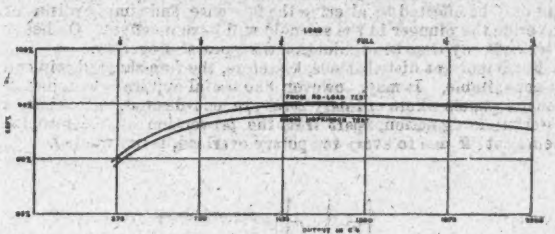


Fig. 3.—Efficiency Curves.

over the group of conductors, previously taped. An extra thickness of insulation is provided between the top and bottom members of two coils in a slot. A suitable number of equalising rings of large section is provided.

The commutator is of hard-drawn high-conductivity copper, and is insulated with mica. Each segment was milled to the correct taper before being built in, and the whole subjected to a heavy pressure before being machined. The brushes are of carbon, the current density at full load being about 30 amperes

Fig. 4.—Siemens 100-b.h.p. Motor, Open.

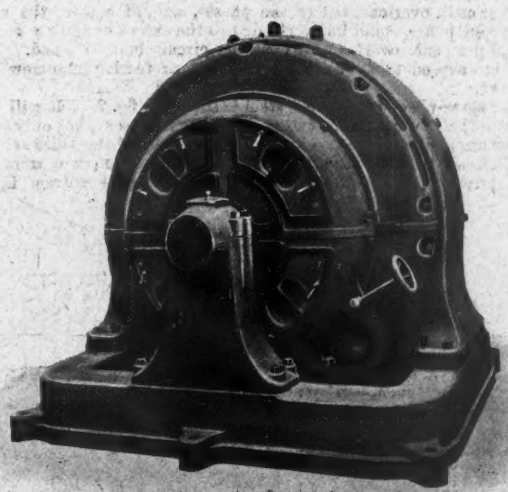


Fig. 5.—Motor with Commutator Cover in Place.

per sq. in. Before leaving the works, the machines were subjected to severe tests, and the excellence of their performance may be gathered from the following:—

For the 12 hours' full-load run at 531 volts 2,900 amperes, the machines were coupled up in the usual way for the parallel Hopkinson method, the losses being supplied electrically and both fields excited from an external source. The run was made with the generator giving the full rated output of 1,500 kw., corresponding to about 14 per cent. overload on the motor. At the end of 12 hours' continuous run at this output, the following temperature rises were observed (by thermometer):—

	Rise in ° C. above surrounding air. Generator.	Motor.
Armature core	29° C.	29° C.
Armature end connections ...	23° C.	24° C.
Commutator	21° C.	18° C.
Shunt coils	31° C.	24·5° C.
Commutation coils	28° C.	32·5° C.

The commutation was sparkless throughout.

In the efficiency test the machines were coupled up as before, and the following results were obtained:—

Speed.	Generator. Gen. amps.	Generator. Field amps.	Motor. Motor amps.	Motor. Field amps.	Volts common to both.	Amps. supplied externally.	Mean load kw.	Efficiency of each machine on mean load.
85·2	740	23·9	842	21·9	532	127	410	90·2 %
85	1,450	24·8	1,595	20·8	528	172	805	93·4 %
85	2,250	27·3	2,560	21·9	530	266	1,272	94·0 %
85	2,970	29·1	3,360	22·8	531	381	1,675	93·8 %
85	3,700	31·1	4,220	24·0	529	536	2,095	93·3 %
85·3	4,500	33·4	5,320	24·9	529	767	2,570	92·2 %

It will be noticed that, besides being well above the guaranteed figures at full load, the efficiency remained high also at light loads. The maximum motor current of 5,320 amperes corresponds to an overload of 84 per cent., and there was only a trace of sparking. In all the other cases the commutation was sparkless.

A third test of 10 hours' duration was also carried out to determine the temperature rises on overload, the following results being obtained:—

Generator current = 3,500 amperes.
Motor current = 4,000 amperes.

	Temperature rise. Generator.	Motor.
Armature core ...	36·5° C.	32·5° C.
Commutator ...	21·5° C.	32° C.
Shunt coils	37° C.	29·5° C.
Commutation coils...	41·5° C.	57° C.

Thus, with an overload of 39 per cent on the motor for 10 hours, the only parts with a temperature rise higher than was specified for the normal load of 2,900 amperes were the commutation coils

The reason for the lower temperature rises on the motor is due to the fact that the cool air was delivered to the motor side of the combination, and the generator had the disadvantage of receiving air which had already passed the motor. In calculating the temperature rise, the mean air temperature was taken, and this, of course, handicapped the generator. The commutation was perfect throughout the test.

It is well known that the sum of the no-load losses, plus the additional $c^2 r$ losses due to the load, does not make up the total power lost at full load, but the extent of this discrepancy is not generally recognised, and has led to much doubtful practice in specifying efficiencies. The serious nature of this error is well illustrated in fig. 2, in which the upper curve represents the total losses as given by the Hopkinson test, and the lower curve the total losses as obtained from a no-load test. In curve 1, fig. 2, half the losses supplied from external sources are plotted against the mean load of the coupled machines as found from the Hopkinson test. The discrepancy in the efficiency as obtained by these two methods is very considerable, as may be gathered from fig. 3 and the following table:—

Load.	Efficiency by Hopkinson test. Per cent.	Efficiency by no-load test. Per cent.	Guaranteed efficiency. Per cent.
50 per cent. overload ...	93	94·5	—
Full load	94	95	93
¾ „	94	94·8	—
½ „	93	93·8	—
¼ „	89·5	90·2	—

In view of the fact that machines are sometimes required to give their full-load current with a very weak field (for instance, for Siemens-Ilgner fly-wheel converters for colliery winding, where a current considerably in excess of full-load current may be required at practically zero volts), it was decided to test these machines also in this direction. The test was a short-circuit test, and it was observed that about 2 per cent. of the normal shunt current was required to produce full-load armature current, and about 3 per cent. for 50 per cent. overload. With the very weak fields thus produced, a current of 4,500 amperes was taken from each machine in turn, and the commutation was quite sparkless with fixed position of brushes. This current corresponds to an overload of 55 per cent.

Another machine supplied to the War Department, interesting on account of the fact that it is one of the largest, if not the largest, motors yet made with as wide a speed variation as 1 : 6, is shown in figs. 4 and 5.

It is designed to give 100 b.h.p. at a pressure of 500 volts, the speed ranging between 100 and 600 r.p.m. There are six main poles and an equal number of commutation poles. As will be gathered from the illustrations, the motor is of the ventilated

type, the openings being covered with gauze. The speed variation is obtained by shunt control, and on test the motor was perfectly stable and ran absolutely sparkless under all working conditions—from no load to 100 per cent. overload at all speeds. Sparking could not be detected even when the brushes were tilted on to their sparking edges, and a test more severe than this can scarcely be devised. After five hours' run at full load and 350 R.P.M.—the mean speed of the motor—the temperature rise nowhere exceeded 37° F., and after six hours' full-load run at the highest and lowest speeds the temperature rises were quite within normal limits.

The efficiency of the machine at full load is some 88 per cent. from 200 to 400 R.P.M., being slightly lower at the extreme speeds. In view of the unusual nature and very special design of the motor, this efficiency must be regarded as very satisfactory.

PROCEEDINGS OF INSTITUTIONS.

Switchgear Control Apparatus and Relays for Alternating-Current Circuits.

By Charles C. Garrard, Member.

(*Abstract of paper read before the* Institution of Electrical Engineers, *London, May 14th*, 1908.)

The installation of control relays on high-tension alternating-current circuits has become standard practice, and is likely so to continue. The correct design and lay-out of such relays is of the highest importance; on their proper action a large part of the success of the system depends. Recognising this, it is somewhat remarkable that many systems are in operation to-day designed on wholly erroneous lines.

A considerable number of polyphase maximum time-element relays have been installed in various supply stations. They consist of a polyphase-wound relay having a single moving element, which moves under the action of the currents in two or three of the phases.

With such relays very large and dangerous overloads can continue to flow in any one phase, without causing the relay to operate and to open the circuit. Polyphase relays should never be used, but always single-phase relays connected entirely separately on two or three of the phases on three or four-wire systems respectively.

Exactly the same objection applies to the use of polyphase reverse relays. The only perfect solution is to install a separate single-phase relay on each phase.

A considerable number of maximum time-limit relays, operating on the solenoid principle, are in use at the present moment. They consist of a solenoid having a movable iron plunger, which is sucked up when the current in the solenoid exceeds a certain value. The iron plunger is attached to a dashpot or air-bellows which retards the travel of the plunger, the amount of the retardation being varied by means of a small valve which controls the clearance in the dashpot, or the rate at which air can pass in or out of the bellows, &c. Thus the plunger is caused to take a certain time to travel to its top position. When the top position is reached contact is made in the trip-coil circuit and the controlled circuit is opened. A typical relay, made by a well-known firm, operating upon this principle was experimented upon. As the plunger is raised within the solenoid the volt-drop across the same is increased largely, and, of course, the volt-ampere consumption of the relay goes up, and the magnetic reluctance goes down. Now, with a constant magnetising force in the relay the attractive force on the plunger varies inversely as the square of the reluctance. It follows that if, due to the passage of a certain current through the relay, the plunger is caused to travel upwards, the higher the plunger goes the less the current necessary to keep it in its new position. Thus the current in the controlled circuit can fall again to its normal value, but the plunger will not fall, but remains "floating" for an indefinitely long period near its top position. If, now, the current again increases, the plunger will complete its upward journey, but without any time element whatever, this being due to the fact that the first small movement in a dashpot is unretarded, no matter from what position in its travel the plunger starts.

Experiments made to test this theory confirmed it in every particular. The results show that the dashpot solenoid type of maximum relay is not to be relied upon for dealing with intermittent overloads or shorts.

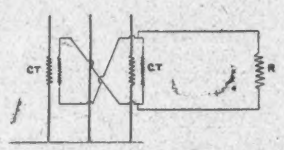
A method sometimes adopted to impart a time-element characteristic to an ordinary circuit-breaker is to shunt the trip coil with a fuse. Normally the secondary current of the current transformer flows through the fuse and not through the trip coil, until the fuse blows and the current is diverted through the coil. The time taken for the fuse to blow gives the time element. It is only possible to use this scheme for alternating currents, as with continuous currents the whole of the current passes through the trip coil, and a sufficient volt-drop to blow the fuse cannot be obtained. The chief advantage of this scheme is cheapness. Its efficiency may be judged from the following considerations. The two essential functions of a time-element device are as follows:—

1. The time lag should prevent the circuit-breaker opening with every momentarily abnormal rush of current.

2. A discriminating action should be obtainable—that is, if two time-element circuit-breakers are in series, it should be possible to adjust one to open before the other.

The second function is vital in all important circuits. Experiments made to ascertain how far this discriminating action could be attained showed that altering the thickness of the wire not only altered the current at which the combination worked, but also affected the time element enormously. Thus independent adjustments of the time and the current calibrations are not feasible—at least, if fuse wires of constant length and of the same material are used. Regulation of the current at which the arrangement works can only be effected by altering the fuse wire, and simply raising or lowering the plunger in the solenoid will have no effect. On heavy overloads any time discrimination disappears altogether.

For important distributions, therefore, the fuse-shunted trip coil is not suitable. It may, however, find useful application on motor-control panels where ordinary fuses are not desired, and where a discriminating action, apart from the prevention of the machine being cut off due to every temporary overload, is not wanted.

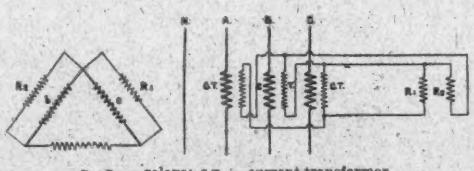


R = relay; C.T. = current transformer.

Fig. 1.—Faulty Relay Connections on Three-phase Three-wire Circuit.

For three-phase three-wire systems two separate single-pole relays are theoretically necessary to afford complete protection. When what may be designated the "resultant" scheme of connections has been used, a single one-phase relay only has been installed, but in conjunction with two current transformers, so connected that the current in the relay is the vectorial resultant of the current in each of the phases in which the current transformers are situated (fig. 1). A superficial examination would lead one to think that as the relay current is the resultant of the currents in the two phases, an overload in either will cause the relay to operate and thus afford complete protection. A number of supply stations in this country have protective apparatus installed in this manner. On working out the currents in the relay vectorially, however, it will be found that the protection afforded by this method is doubtful. We will assume the normal full-load secondary current of the transformers to be 10 amperes, and that the relay is set to operate at 200 per cent. of full-load current; that is, it will operate when 34·6 amperes flow through it. If now the overload occur on both the phases connected to the relay, and the phase displacement in each phase is the same, then the circuit is opened when 20 amperes secondary current flows in each phase. It is quite likely, however, that the overload will only occur in one of the phases, and in this case the phase displacement will most probably not be the same in each phase. If the angle of lag in each phase is equal, and only one of them is overloaded, it will require 282 per cent. full-load current in the single overloaded phase to cause operation. Should, however, the current in the overloaded phase lag 60° more than the other phase, which is quite possible, then the current in the overloaded phase will have to increase to 386 per cent. of full-load current before the circuit is broken. That is to say, with this scheme of connections and the circuit-breaker set so that it comes out with the ordinary test at 100 per cent. overload, one of the phases, and, of course, the unprotected phase, could be overloaded to the extent of 200 per cent. or 300 per cent. overload without the circuit being opened. It will be agreed that such a scheme of protection is somewhat illusory.

The three-phase four-wire system is shown in fig. 2. It will be be seen that three current transformers are necessary, but only two relays are used, the idea being to save the cost of the third relay. At first sight it would seem that, as current in R_1 = current in c + current in a, and current in R_2 = current in b + current in a



R_1, R_2 = relays; C.T. = current transformer.

Fig. 2.—Faulty Relay Connections on Three-phase Four-wire Circuit.

there could not be an abnormal current in any one of the three current transformers without there being a corresponding current in R_1 or R_2.

Exactly the same consideration, however, can be applied to this case as before, as it is quite possible for one phase to be overloaded, since it has a return path through the fourth wire. If this overload has a large phase displacement relative to the currents in the other phases, then the condition may arise of very big overloads in the one phase and the circuit-breaker not operating.

The only safe arrangement is to have the same number of relays as current transformers. If the circuit be a four-wire one, then

three relays are necessary; if a three-wire, then only two relays are essential.

Alternating-current reverse-power relays are installed between bus-bars and sources of electrical energy; thus they are used for controlling generator switches and the switches at the far ends of feeders. In such positions complete protection is afforded by the reverse relay, and the installation, in addition, of maximum current circuit-breaking apparatus at the same places must be regarded as bad practice.

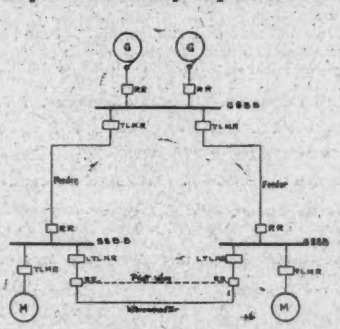
Reverse relays on generators should only come into operation when a serious fault has developed on the generator or prime mover of the nature of an insulation breakdown in the winding, or a total failure of steam-power. A short consideration will show several cases of accident to the prime mover, in which an automatic disconnection from the bus-bars would only be an aggravation of the trouble.

A generator relay which operates instantaneously on a reversal is not desirable.

It will be understood that any form of relay, one of whose constituent parts is a shunt coil, will be affected by variation in the voltage applied to the same. The shunt coil of the generator reverse relay is excited (through the intermediary of potential transformers) directly from the bus-bars. On the occasion of an accident to one of the generators the bus-bar volts will tend to go down. The trouble is intensified by the fact that, as has been stated, an instantaneous relay cannot be used, therefore there is more time for the voltage to fall. It must be remembered, however, that a failing generator in parallel with one or more good ones is not likely to pull the volts down to any very alarming extent. Probably a 50 per cent. reduction is the maximum to be expected. It is clear, however, that the calibration of the relay should be as little affected by variation in the bus-bar voltage as possible. The effect of reduction of the shunt voltage on the calibration of a reverse-power relay, consisting of a specially designed wattmeter movement, is practically negligible down to 10 per cent. of the normal voltage. The limit down to which it works is 7 or 8 per cent.; below that it becomes inoperative. The relay is also absolutely inoperative on forward power under all conditions; tests made up to ten times full-load current in the forward direction have proved this.

The most suitable value to which a generator reverse relay should be set is such that it will operate, after the requisite time element, with an energy reversal of 10 per cent. of the full rating of the machine. With this setting the current which can flow in the generator windings is never very excessive.

The function of reverse relays at the ends of feeders is to prevent a fault on the feeder being fed back from the sub-station or distribution network. The currents which flow into such a fault will have passed through long lengths of feeder, the C R and inductive drop in which will cause the voltage applied to the shunt of the relay to fall. Thus reverse relays, situated at the ends of feeders, are far more likely to be affected by drop in volts than are those on



G, Generator; R R, Reverse relay; G S B B, Generating station bus-bar; T L M R, Time limit maximum relay; S S B B, Sub-station bus-bar; L T L M R, Long time limit maximum relay; M, Motor.

Fig. 3.

generators. For this reason it is desirable for the relay to operate as quickly as possible after the occurrence of the reversal. Temporary reversals of energy in a feeder may happen, however, due to hunting of the sub-station machinery, set up by a temporary disturbance in the system. With an instantaneously operating relay the circuit may be opened when there is not any need for it. The instantaneous reverse relay at the far end of the feeder should be set, therefore, so that the minimum power required to operate it is above that likely to flow back, owing to such a harmless hunting of the sub-station machinery. It follows that the feeder-end relay should be set proportionately higher than the reverse relay on the generator; probably if it were set to operate at 25 per cent. of the normal full-load capacity of the feeder it would form the most suitable arrangement. Other considerations also indicate that a higher power setting of the feeder-end relay than the generator relay is admissible.

A diagrammatic representation of a generating station feeding two sub-stations connected together by an interconnector is given in fig. 3. It is conceivable that, owing to faulty superintendence, the current in the interconnector may mount up to such an extent that damage to it may result; some kind of maximum circuit-breaking device is desirable, therefore, and as the only object of this is to prevent thermal damage, the time element should be very long—longer than that of any of the other maximum circuit-breakers on the system, whose function it is to deal with shorts and accidental temporary overloads. The interconnector, from the point of view of control, is a prolongation of the sub-station bus-bars. So long, therefore, as the interconnector is in good condition, and not permanently overloaded sufficiently to be burned, overloads and shorts on the system should never cut it out of circuit. The occasion when it should be cut off is when it goes wrong itself, either by grounding or shorting. It is obvious that to attain this end something more is needed than simply maximum or reverse relays at either end of the interconnector, as these cannot discriminate between shorts or grounds in the interconnector, and in other parts of the system. To solve the problem it is only necessary to consider that the function of the interconnector is to pass energy from one sub-station to the other in either direction; so long as it is doing this, it may be said to be performing its function. It is, however, not doing so when it takes energy from one sub-station and does not deliver it to the other—that is, when energy flows into the cable at both ends at the same time. It follows that a circuit-breaking apparatus must be installed at either end, and that these must be interconnected together. This is done generally by means of one or more pilot wires.

The principle on which the Merz-Price method depends is illustrated in fig. 4. A current transformer (C.T.) is included in the interconnector at either end, the secondaries of which are connected together through the trip coils (T.C.) and the pilot, the return circuit being *vid* earth. So long as the current flows through both current transformers in the same direction, it is immaterial in which direction, the E.M.F.'s induced in the secondaries of the C.T.'s balance, and current does not flow through the pilot and trip coils. So soon, however, as the currents at either end become unequal, or a reversal at the one end relatively to the other takes place, current begins to flow in the trip coils, and when this has reached a

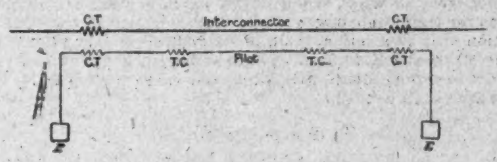
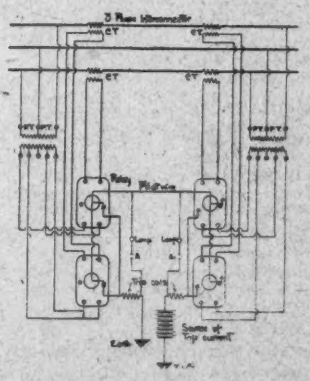


Fig. 4.—Merz and Price's System of Protection of Interconnectors.

sufficient value the switches are opened. It may be mentioned that differential relays are used usually, in addition, for operating the tripping mechanism of the switches, as the arrangement of fig. 4, although quite right theoretically, cannot be applied practically in the simple form shown.

The advantage of Merz and Price's arrangement is that potential transformers are done away with altogether. In order to secure full protection, however, more than one pilot wire has to be run for each three-phase interconnector.

As the criterion of failure of an interconnector is the simultaneous flow of power into it at either end, such a circuit can be protected by the installation of reverse power relays at both ends, both relays



C T, Current transformer; P T, Potential transformer; A A_1 are contacts which are closed when the circuit-breakers are open.

Fig. 5.—Protection of Three-phase Interconnector by Means of Electrically-interlocked Reverse Relays.

being connected in a common tripping circuit arranged so that only when energy is flowing into the cable at both ends is the trip-coil circuit closed at both relays, and the main switches caused to open circuit (see fig. 5). Normally the trip circuit is broken at one relay and made at the other, or *vice versa*, according to the direction of flow of power in the circuit. The relays close circuit with a slight time element so that, on the flow of current reversing, one of the contacts is opened at the one relay before the other one is closed. On reference to fig. 5 it will be seen that only when power is flowing into the cable at both ends at the same time is the trip-coil circuit complete through each trip coil and the circuit ruptured at both ends.

A and A_1 are each a pair of contacts which are closed automatically when the main circuit-breaker at the corresponding end opens. Thus, if the switch at the left-hand end of the interconnector opened

slightly before the one at the right-hand end, the trip-coil circuit would be closed at A and by the relay at the right-hand end. Thus the circuit-breaker at the right-hand end would also operate. The object of this arrangement is to ensure that both ends of the interconnector will be disconnected even if the two switches do not act quite as quickly as each other. Each trip coil is also arranged so that it is cut out of circuit when its main switch has opened circuit, after, however, A (or A_1, has been closed. The trip coils, therefore, experience no danger of burning out. The state of affairs might, however, arise that the left-hand switch was open and the right-hand switch was closed, there being a short or earth on the interconnector. By the act of closing the right-hand switch the trip coil of this switch will be put into circuit ready for operation, and the circuit through the same will be complete through the right-hand relay, which operates due to the flow of current into the fault, and through A. Thus the right-hand circuit-breaker will be opened, while at the same time cutting out its own trip coil. Thus it is impossible to connect up the interconnector at either end while there is a fault on the same.

The arrangement as set forth above of course necessitates that there should be some voltage in order to operate the relays. If the voltage absolutely disappears, the reverse relay will not work, and it may be thought that in the case of a very bad short circuit this will happen. Considerable experience has shown, however, that even under the worst conditions the voltage does not entirely disappear, and that if the calibration of the apparatus is unaffected by fall of potential down to 10 per cent. of the normal working voltage all working conditions will be met.

As the pilot wire only carries the tripping current, it will be seen that only one pilot is necessary, whether the relays are single, two, or three-pole. On a three-phase system the relays will be two or three-pole according to whether the system be three-wire or four-wire. Messrs. Merz and Price suggest that the pilot wire, or wires, can be made up in the same multicore cable as the main conductors; this, however, is open to the serious objection that if a serious fault or burn-out occurs, the pilot wire will most probably be broken. It would be much better to keep the pilot wire quite distinct from the main cable, preferably laying it in a different duct.

(To be concluded.)

NEW PATENTS APPLIED FOR, 1908.

Compiled expressly for this journal by W. P. THOMPSON & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

12,813. "Improvements in or relating to primary batteries." P. G. THIQUET. (Date applied for under Sec. 91 of the Act, June 13th, 1907, being date of application in France.) June 15th. (Complete.)

12,841. "Improvements in thermo-electric batteries." J. MARSCHALL. June 16th. (Complete.)

12,872. "Plating rack." H. V. SMITH and E. H. H. SMITH. June 16th. (Complete.)

12,881. "Improvements relating to magneto-ignition devices." E. V. CRATZE. June 16th.

12,908. "Improved sparking plug for explosion engines." M. EYQUEM. (Date applied for under Sec. 91 of the Act, September 21st, 1907, being date of application in France.) June 16th. (Complete.)

12,928. "Improved point-shifting arrangements for electric tramways and the like." J. P. TIERNEY and J. MALONE. June 17th.

12,968. "Improvements in the manufacture of filaments for electric glow lamps from refractory material in the colloidal state." H. KUZEL. (Application for Patent of Addition to No. 23,154/04.) June 17th. (Complete.)

12,987. "Improvements in electrical socks." G. H. HOOPER and H. H. HOOPER. June 18th.

12,991. "Improvements in electric or gas pendants." E. C. PECK. June 18th.

12,997. "Improvements in magnetic compasses." C. BATTY and W. BATTY. June 18th.

13,014. "Appliance for handling electric bulb lamps in positions where ladders would otherwise be necessary." A. T. STACE and C. F. PALLOTT. June 18th.

13,015. "Improvements in and relating to electric incandescent lamps." J. GRAY. June 18th.

13,023. "Improvements in electric detectors." H. STEPHENS. June 18th.

13,025. "Improvements relating to electric switches." A. P. LUNDBERG, G. C. LUNDBERG and P. A. LUNDBERG. June 18th. (Complete.)

13,029. "Improvements in metal filaments for electric incandescent lamps." T. W. LOWDEN and THE WESTINGHOUSE METAL FILAMENT LAMP CO., LTD. June 18th.

13,048. "Improved automatic cut-out for electrical conductors in tramway systems." M. G. NEWBOULD. June 18th. (Complete.)

13,078. "Improvements in electric motor controllers." E. SCHATTNER and R. AMBERTON. June 19th.

13,092. "Improvements in and relating to electric transformers." AKT.-GES. BROWN, BOVERI & CIE. (Date applied for under Sec. 91 of the Act, June 28th, 1907, being date of application in Switzerland.) June 19th. (Complete.)

13,100. "Improvements in and relating to arc lamps." H. MIERTSCHKE. June 19th. (Complete.)

13,101. "Improvements in party line telephone selectors and cut-outs." H. D. WILLIAMS. (Date applied for under Sec. 91 of the Act, June 19th, 1907, being date of application in United States.) June 19th. (Complete.)

13,107. "Improvements in or relating to electrically heated apparatus suitable for cooking and other purposes." A. F. BERRY. June 19th.

13,133. "Improvements in brakes for electric motor-cars." C. DEGOUMOIS. (Date applied for under Sec. 91 of the Act, June 21st, 1907, being date of application in Switzerland.) June 19th. (Complete.)

13,134. "Improvements in electrolytic cells for separating the constituents of a mixture of metal or an alloy." U. G. DE DEGROSSISSAGE D'OR. (Date applied for under Sec. 91 of the Act, July 11th, 1907, being date of application in Switzerland.) June 19th. (Complete.)

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13,184. "Improvements in electric melting furnaces, pots, ladles and the like." O. A. ZANDER. (Date applied for under Sec. 91 of the Act, June 20th 1907, being date of application in Sweden.) June 20th. (Complete.)

13,185. "Improvements in and relating to automatic switches for either direct or alternating current." L. SUNDERLAND and G. C. PILLINGER. June 20th.

13,191. "Improvements in or relating to electric telegraphy." J. A. L. DEARLOVE. June 20th.

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